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COMPLETE EXHAUSTION OF NUX VOMICA.

BY R. ROTHFR.

Most persons are possessed of a peculiar and contradictory trait which causes them to abhor medicines in general, yet also renders them desirous of taking it as strong as possible. This disposition is shown in the passion for dark-colored liquids, with other striking qualities. When in domestic practice, for instance, a decoction is prepared, its general goodness is judged by the degree of its predominant features, as color, flavor, odor, etc. The endeavor is always directed towards the production of an extract of the greatest attainable strength. The idea of exhausting the raw material rarely occurs; the prime object is almost invariably a saturated preparation, regardless of the residue. This character was very conspicuous in the early stages of pharmacy; its generally crude and unexact methods sought only for a gross effect, not a definite result. These processes, although in the main inaccurate, were, however, at the base of a system which when developed might have assumed grand proportions, since the principle of a saturation, once fully recognized, would lead to the highest order of exactness. The prevailing tendency, however, took another direction, and, resting itself on the original raw material as a starting point, culminated in a system of simple and definite yet arbitrary proportions, implying the complete exhaustion of the active agent. But pharmacy still retains a few lingering rudiments of its primitive character, of which wine of colchicum, tincture of capsicum, tincture of cantharides and tincture of nux vomica may be cited as examples. In all of these the rule of definite numerical proportion of course prevails, but, avowedly or not, the fact is granted that saturation is the result to be attained. At the present day this implication is lost sight of, and, because the residue in all such cases still remains charged with activity, these formulas are considered to be defective. Therefore, instead of

reducing the quantity of raw material in requisite proportion, attempts are made to exhaust it by means of more appropriate solvents. This may be accepted as the proper course in conformity with the prevailing system, and therefore the processes for all such preparations should be remodeled accordingly.

Tincture of nux vomica is an important and useful preparation, and by virtue of its active principles a very powerful one. Definiteness in its construction should therefore be one of its prime features. It is questionable whether the primitive method at present in use really secures a saturated solution. Neither the strychnine or the other alkaloids are free, since the great excess of igasuric acid insures compounds which, although soluble in alcohol, are but sparingly soluble in water. Now, by reason of a peculiar gummy substance contained in nux vomica, insoluble in alcohol, in which the alkaloidal compounds are imbedded, alcohol can only exert a surface action, and hence will be effective in a measure in proportion to the fineness of the powder. Although water or weak alcohol softens and permeates the horny body, either of them fails to extract the now sparingly soluble igasurates. It is therefore evident that nux vomica cannot be exhausted by any form of alcohol. Acidulated alcoholic menstrua are equally powerless, because igasurates, like tannates of the alkaloids, are indecomposable by weak acids.

Seeing that the gummy matter is the chief obstacle to exhaustion, the writer sought to decompose it, in a preliminary operation, by means of dilute sulphuric acid. Failing with this, ammonia was tried with a little success; but having accidentally added some borax to the ammoniacal mixture a rapid coagulation was noticed. Upon this, powdered nux vomica was mixed with borax and percolated with a menstruum composed of equal measures of alcohol and water, and, although absolute exhaustion of the powder was readily achieved, the percolate possessed such an obstinate turbidity that the process, otherwise so satisfactory, was yet a failure. Boric acid, applied in a similar manner, was as inefficient as other acids previously tried. It was next resolved to test potassium citrate, which insured a satisfactory product, and absolute extraction of the drug. Deeming a simpler saline body more appropriate and obtainable, the writer resorted to sodium chloride, and attained, above all others, the most perfect result.

It is remarkable what a solvent action a saline substance has on the

active constituents of nux vomica; the horny matter is speedily softened, permeated and extracted without becoming in the least mucilaginous or distended. The weak alcoholic saline menstruum percolates the powder with such freedom that this must be very firmly packed, and the flow of the percolate further regulated with appropriate checks. The thorough exhaustion is effected, in all probability, by reason of a double decomposition occurring between the igasurates and the sodium chloride in the presence of weak alcohol, resulting in the generation of strychnium chloride, brucium chloride and sodium igasurate, all of which being very soluble in diluted alcohol. When this solution is diluted with water a retrograde decomposition sets in, the igasurates of the alkaloids are precipitated, and sodium chloride remains in solution.

From a consideration of the above cited results the following facile formula for an absolutely representative tincture of nux vomica is obtained.

Take of Nux vomica, in fine powder,	8 troyounces.
Sodium chloride,	6 drachms.
Alcohol,	
Water,	of each 1½ pint.

Dissolve the sodium chloride in the water; then add the alcohol, and mix them. Upon 2 troyounces of the nux vomica, contained in a large capsule, pour 2 fluidounces of the menstruum, and mix them by means of a pestle; then gradually add the remainder of the nux vomica, and thoroughly mix the whole as before. Pack this mixture very firmly into a cylindrical glass percolator, and pour on of the menstruum little by little until, in the course of six to eight hours, the liquid has descended to the bottom of the column. Now suspend the operation, and after twelve hours pour on more of the menstruum, and regulate the flow at the exit so that after twenty-four hours 2 pints of percolate may be obtained. To avoid a trace of turbidity, which is liable to appear in the first fluidounce of percolate when the menstruum is added too rapidly at first, 1½ drachm of the sodium chloride may be mixed with the nux vomica before packing, and the remainder dissolved as before. The finished tincture contains ¼ grain of sodium chloride in 15 minims.

ORIENTAL NOTES.

BY PROFESSOR X. LANDERER.

Oriental tea plants, called *tsai*, are quite numerous (see also "Amer. Jour. Phar.," 1875, p. 498, 532; 1876, 193; 1877, 155), some of the most important being the following:

Tilia argentea, Desf.—The flowers, deprived of the leafy bracts, are sent from Macedonia and yield a tea of an agreeable taste, which is usually mixed with Hymethus or Thymari honey, collected near the Hymettus mountain, where the bees visit the flowers of Thymus (Satureja) Thymbra. In the ancient Hellenian times Apollo was regarded as the protector of bees, and in the temple was adorned with a wreath of thymbra.

Betonica officinalis is collected by the monks of Agion Oras on Mount Athos. It was called *kestron* by Dioscorides,¹ and was, and is still, highly valued as a remedy in many complaints, and as such is frequently sent to friends as a present.

Adiantum Capillus Veneris, Lin., is known in Oriental countries as *polytrichi*, and is highly valued for promoting menstruation and in nearly all diseases of women. The name *Adiantum* is derived from *ou*, not, and *diaino*, to moisten, the plant growing on rocks in moist localities and brooks without being wetted, the water not adhering. It was formerly also called *polytrichon* and *kalliphyllon*.

Greek wines are now extensively exported to all parts of Europe in consequence of the devastation of numerous vineyards by the phylloxera, which thus far has not made its appearance in Greece. It is more particularly the volcanic island of Santorin where many wines are produced, closely resembling those of Spain, Sicily, Southern France and the Cape wines; these sweet wines are called *vino santo*. The concentrated, unfermented grape juice, known in Turkey as *betnese* (see "Amer. Jour. Phar.," 1875, p. 534) is now largely exported to Central Europe, where it is fermented with the juice of the native grapes, and thus employed for improving the more acidulous wines of more northern latitudes.

Viverra Civetta is known in Abyssinia as *zebad*. This ferocious and rapacious animal is caught by snares and kept in a cage for the purpose of obtaining the civet, which is removed by means of a small

¹ *Kestron* of Dioscorides is generally referred to *Betonica Alopecurus*, Lin., which is rather common in Southern Europe.

spoon from the pouch between the anus and genitals, and is also found adhering to the trunks of trees from the animal rubbing on them. This secretion is a thick liquid, and is put into the horns of goats, or, for the retail trade, into small tin boxes. It is extensively used as a perfume, sometimes under the name of *moskos*, the men employing it on the turban and the women on their veils. Civet is also used as a remedy in hysterical and other nervous complaints, and is used for protecting cloths from moths, the cloths being kept in chests made of cedar or cypress wood. The price of a civet cat is from 2,000 to 3,000 piastres, and from 500 to 1,500 piastres are paid for the skins which are used for furs.

Argentiferous galena was worked near Laurium by Pericles 2,300 years ago in an *ergasterion*, workshop, and the silver obtained by a kind of cupellation; the precious metal furnished the means for erecting the grand architectural and sculptural works, the remnants of which are admired to the present day. The slags accumulated from the smelting works received no attention until 1863. The author had found in such slags 8 per cent. of lead containing silver, and it was ascertained that the amount varied between 4 and 14 per cent. These slags were purchased by Sicilian speculators at a very low price, and have been smelted since 1865, large quantities of argentiferous lead having been obtained, containing to the ton often from 500 to 1,200 grams of silver, which is prepared from it in France and England. More recently the mines and the *ekbolades*, or argentiferous refuse, are worked by a Greek stock company, the ore being first washed to separate the earthy matter, then formed into bricks and smelted with charcoal. By gambling in these shares many families have been reduced to poverty.

Zinc Ores in Greece.—Until a few years ago the existence of calamine in Laurium was unknown; at present there are many mines, some of them 100 to 120 meters deep, yielding handsome ores occasionally associated with crystals of malachite or in stalactitic forms. The ores are roasted, when a blackish-gray powder is obtained, which is exported to France and England, where it is converted into the metal. Zinc ores have also been discovered upon Tsesme in Asia Minor, opposite Chios, and upon the islands of Samos and Antiparos. Valuable ores, such as chrome-iron, argentiferous lead and emery have also been found in Thessaly, and a very handsomely crystallized nickel arsenate was discovered in Laurium.

GALENICAL PREPARATIONS OF THE GERMAN PHARMACOPŒIA.

In the following we propose to publish from the new German Pharmacopœia the formulas of such preparations for which no equivalent one is contained in the new Pharmacopœia of the United States, reserving for another paper a comparison of those preparations which are found in both. The alcohol, *spiritus*, of the German Pharmacopœia, has the density .830 to .834 at 15°C. and contains between 91.2 and 90.0 per cent. by measure, or between 87.2 and 85.6 per cent. by weight of absolute alcohol. When water is directed, distilled water is to be used. All preparations are made by weight. The exhaustion of drugs is effected by maceration, usually continued for eight days, when the dregs are expressed and the liquid is filtered; the deficiency in liquid is *not* made up by the subsequent addition of menstruum; hence the proportions given are those of drug to menstruum, not, as in the U. S. Pharmacopœia, of drug to finished preparation—and the weight of the resulting preparation really is in excess of the menstruum, the excess corresponding to the weight of the soluble matter taken up, while on the other hand a portion of the preparation is lost by being retained in the powder and in the presscloth.

Acetum Aromaticum.—Oil of lavender, peppermint, rosemary, juniper and cinnamon of each 1 part; oils of lemons and cloves, each 2 parts; alcohol 300 parts; acetic acid, sp. gr. 1.041, 450 parts; water 1,200 parts. Dissolve the oils in the alcohol, add the acid and water, shake the turbid mixture occasionally during several days and filter. It is colorless, does not become turbid on the addition of water and has the specific gravity .987 to .991.

Acetum Digitalis.—Digitalis leaves, finely cut, 5 parts; alcohol 5 parts; acetic acid, sp. gr. 1.041, 9 parts; water 36 parts. Macerate for eight days, express and filter. It is brownish-yellow and has an acid and very bitter taste. Maximum dose, single 2.0 grams; per day 10.0 grams.

Acidum Carbolicum Liquefactum.—Crystallized carbolic acid 100 parts; water 10 parts; mix.

Ammonium Chloratum Ferratum.—Chloride of iron and ammonium. Ammonium chloride 32 parts; solution of ferric chloride, sp. gr. 1.280 to 1.282, containing 10 per cent. of iron, 9 parts. Mix and, with constant agitation, evaporate to dryness by means of a steam bath. It

is reddish-yellow, becomes moist in the air, is freely soluble in water and contains about 2·5 per cent. of iron.

Aqua Carbolisata.—Liquefied carbolic acid 33 parts; water 967 parts. Dissolve.

Aqua Picis.—Tar 1 part; powdered pumice stone, washed and dried, 3 parts; mix, agitate frequently for twelve hours with water 10 parts, and filter. It is yellowish or brownish yellow.

Balsamum Nucistæ.—Yellow wax 1 part; olive oil 2 parts; expressed oil of nutmegs 6 parts. Melt together by the aid of a steam bath, strain and pour into capsules. It is brownish-yellow and of an aromatic odor.

Elæosacchara are made, when needed, by mixing the volatile oil prescribed, 1 drop, with powdered sugar 2 grams.

Elixir Amarum.—Extract of wormwood 10 parts; peppermint oil sugar 5 parts; water 25 parts. Rub together and add aromatic tincture and bitter tincture, of each 5 parts. It is slightly turbid and of a deep brown color.

Tinctura amara is made by macerating for a week gentian and centaury each 3 parts; bitter orange peel 2 parts; unripe orange berries and zedoary, each 1 part in diluted alcohol (sp. gr. ·892 to ·896) 50 parts. It is greenish-brown, aromatic and bitter.

Tinctura Aromatica.—Cinnamon 5 parts; ginger 2 parts; galangal, cloves and cardomom of each 1 part; diluted alcohol 50 parts. It is brown red and of a very aromatic odor and taste.

Elixir e Succo Liquiritiæ.—Purified extract of liquorice 10 parts; dissolve in fennel water 30 parts; add anisated ammonia liquor 10 parts and, after two days, decant. It is turbid, brown, and on being diluted with 10 parts of water becomes clear.

Liquor Ammonii Anisatus.—Dissolve oil of anise 1 part in alcohol 24 parts and add ammonia water (sp. gr. ·960) 5 parts. It is clear and yellowish.

Succus liquiritiæ depuratus is commercial liquorice, exhausted with cold water, the clear solution being evaporated to the consistence of an extract.

Emplastrum Cerussæ.—Melt together lead plaster 60 parts; common olive oil 10 parts; add very finely powdered lead carbonate 35 parts, and boil with a little water until a plaster is formed. It is white and hard.

Emplastrum Fuscum Camphoratum.—Boil finely powdered litharge

30 parts with common olive oil 60 parts, stirring constantly until the color becomes blackish-brown; add yellow wax 15 parts, and camphor 1 part, rubbed with a little olive oil. The plaster is blackish-brown, tenacious and has the odor of camphor.

(To be continued.)

PRÉPARATIONS OF ERGOT, BASED UPON THE LATEST SCIENTIFIC INVESTIGATIONS OF ITS MOST VALUABLE MEDICINAL CONSTITUENTS.¹

BY C. S. HALLBERG, CHICAGO.

Ergot of rye ranks undoubtedly among our most largely used and important remedies. Like opium and cinchona, it plays a rôle in relieving human suffering, specific in its character and not easily displaced by any other agent. But unlike these, although the history of ergot is even more ancient and in its universal occurrence is familiar even to the less well informed, our chemical and pharmaceutical knowledge of it is far behind that of these two contemporaries. So much more is this to be wondered at since, owing to its occurrence where it is encountered every day, and its occasional presence in the "staff of life" has been followed by the most serious consequences. Long after its therapeutic value was conceded its constituents were little known, very erroneous conclusions were arrived at by those to whom the credit of its first chemical investigation is due and upon these were based processes for the various pharmaceutical preparations. It is only necessary to compare the product ergotin, formulated by Bonjean and Wiggers respectively, to see the lack of uniformity in the views held by these investigators. These two processes were so radically different that the products were equally distinct in physical and therapeutic properties. The first mentioned aimed at presenting those constituents soluble in diluted alcohol *only*, as being of the most value, to the exclusion of the fixed oil, alcoholic extraction and other well recognized disturbing principles; in Wiggers's process the matter soluble in diluted alcohol, considered the most important by Bonjean, was rejected and the poisonous products claimed to represent the most valuable medicinal properties of the drug. Although ergot is largely obtained in this country, it is small in grain and cannot favorably compare with the

¹ Read at the third annual meeting of the Illinois Pharmaceutical Association.

large grain Spanish, which, though commanding a greater price, is to be preferred when it can be obtained fresh and free from worms. This ergot presents a dark pearl color, and when of good quality should present a smooth fracture with a curved violet line; it must not be spongy or yellowish. The preservation of ergot is rather difficult, particularly of the powdered, and different means have been devised to prevent it becoming worm eaten, etc., such as heating before bottling, and addition of camphor, ether and chloroform. Hager has proposed:

PULVIS ERGOTÆ PURIFICATUS, which is prepared as follows: Ergot in coarse powder is first exhausted of its fixed oil, by means of percolation with deodorized benzin, it is then extracted with strong alcohol which displaces the benzin and takes up about 2 or 3 per cent. of a black resinous matter and the poisonous alkaloid *ergotinina*. The alcohol is recovered by distillation, and the ergot is spread out in shallow pans set in a warm place so that any remaining odor of benzin may be dissipated. The original process consists only in freeing the ergot from the fixed oil, but the subsequent percolation with alcohol is desirable, as it displaces the greater portion of the benzin, extracts the asphalt-like resin, thus rendering the ergot more readily exhausted with water, and deprives it of the poisonous principle. The purified ergot thus obtained loses from 25 to 30 per cent. in weight, and is therefore of correspondingly greater strength than the crude drug. Unlike the ordinary powdered ergot, this article can be preserved in glass-stoppered bottles for any reasonable length of time, according to the writer's experience, owing probably to the fact that it does not contain any *ergotinina* to the decomposition of which the rapid spoiling of ergot is due. The coarse powder will be found very convenient for the preparation of wine, infusion, etc., and the finely pulverized can be administered in substance. The petroleum benzin used in this process is the commercial sp. gr. 716. The mode of deodorizing it is as follows: To the benzin add gradually with agitation about 3 per cent. sulphuric acid diluted with an equal quantity of water; after standing decant from the black tarry residue. Wash the benzin with water to which has been added sufficient carbonate of soda to neutralize the acid, decant and then wash repeatedly the benzin, lastly separate carefully from the water or distil. This yields a product possessing very little taste or odor, and will be found very useful in the laboratory and for domestic use.

OIL OF ERGOT.—The yield of fixed oil from ergot ranges from 25 to 30 per cent. It is very heavy, dark-brown in color, almost odorless,

and sometimes separates, upon standing, stellate tufts of a pearl color supposed to be *cholesterin*. The oil yields an orange-yellow soap. It has been lately recommended for skin diseases, and the soap could possibly be used to advantage. The writer has used several hundred pounds of the oil as a *lubricator* for machinery and found it *unequaled*.

To determine if the oil contained any alkaloid, it was agitated with very little dilute sulphuric acid; the acid liquid concentrated and an excess of caustic soda added, which threw down a cinnamon-brown body. This precipitate was washed with water, in which it seemed insoluble, and citric acid added. Upon further standing well defined crystals were formed, which were colored orange-yellow by sulphuric acid; *but showed no precipitation with alkaloid reagents*. This substance was supposed to be *Sclero-crystallin* which, according to Dragendorff, is of no medical importance.

ALCOHOLIC EXTRACTIVE.—The asphalt-like resinous mass above referred to, extracted with strong alcohol, which, according to Hager, is only fit to burn up, was examined with a view to isolate the alkaloid ergotinina. It was broken up, some soda added and extracted with ether and the ethereal liquid mixed with water, but sufficient soap was held in solution to prevent the liberation of the ether, which should contain the alkaloid, the mixture forming a thick emulsion which after long standing did not show any signs of separation. The production of this rare alkaloid was therefore temporarily abandoned and its isolation is undoubtedly coupled with great difficulties as the most thorough pharmaceutical chemist, Dragendorff, failed in it and is of the opinion it is almost impracticable. The ethereal solution previous to the addition of water left upon evaporation acicular crystals which corresponded in tests and appearance to sclerocrystallin.

FLUID EXTRACT OF ERGOT.—The official process of the last pharmacopœia was based upon too general a method without any regard for the extraction of the active constituents or their preservation. The addition of acetic acid previous to the concentration of the weak percolate was unnecessary and irrational as the active principle being itself an acid, an alkali would have been better adapted to prevent its volatilization if fugitive. The alcoholic strength of the menstruum was too great, as it extracted none of the *scleromucin* which is only soluble in alcohol of 40 per cent. and under. The glycerin and the high alcoholic percentage were favorable to the extraction of the oil and the ergotinina, which were possessed of undesirable, if not actually poisonous,

properties. The menstruum adopted in the new pharmacopœia will undoubtedly be as *aqueous* as possible to insure a permanent product. Alcohol of 40 per cent. yields a very good preparation representing the drug *fairly*, but still containing more or less fixed oil and alcoholic extractive. The writer is, therefore, of the opinion that the ergot should first be freed from oil and resin, before a fluid preparation can be made from it, representing *all* the valuable medicinal constituents of the drug to the exclusion of inert matter and those principles possessed of undesirable qualities.

FLUID ERGOT.—Upon the investigations of Dragendorff, Podwissotzky, Blumberg and others having been made public, new processes were adopted for preparations that would conform to these theories. The writer constructed a formula for a preparation termed fluid ergot, in contra-distinction to the official fluid extract. As this article has proved during several years increasing use its superiority over the ordinary fluid extract, and clinical experience sustained the views held in regard to it on theoretical grounds, the process for its preparation might be of interest. The powdered purified ergot, prepared as above, is digested with twice its weight of water at 150° F., for twenty-four hours and expressed, the residue is again macerated in warm water for twelve hours. After settling, the expressed liquids are strained and evaporated separately, when both together measure one-half as much as the ergot employed; they are mixed and sufficient alcohol added to make the liquid of 25 per cent. alcoholic strength, or one-third as much as the aqueous solution. After standing the liquid is filtered and the gummy residue washed with so much 25 per cent. alcohol as to make the filtered liquid measure three-fourths or 75 per cent. of the amount of crude drug employed (volume for weight). To this glycerin is added to make the finished preparation represent the amount of crude ergot originally used, pint for pound. As will be seen, this preparation contains 18 per cent. alcohol, rendering it unobjectional for hypodermic use. Fluid ergot is an opalescent, amber-colored liquid possessing a peculiar musty odor. It remains pretty clear unless exposed for a long time to the light or atmosphere. It should, therefore, be kept in small well-filled bottles in a cool dark place. As stated above, the writer introduced this preparation immediately after the Dragendorff and Podwissotzky investigation; similar products at once appeared under different names, and Hager in his Supplement gives a process for what he terms *extract. secalis corn. purif.*

or *ergotina rationaliter parata*. The ergot, according to this process, is extracted with benzin and alcohol, and then exhausted with water, and the liquid concentrated to one-half the bulk of the drug; here the similarity ceases, as Hager employs sufficient alcohol to make the mixture represent 60 per cent. alcohol by volume which precipitates the gum, etc., but also *scleromucin* and renders it necessary to again recover the alcohol by distillation. After this is accomplished the liquid is transferred to a dialysator and dialysed. This part of the process the writer thinks is entirely unnecessary, and almost, if not entirely, impracticable, as decomposition sets in very rapidly in dilute aqueous solution of ergot. The formula for a preparation termed M. Yvons' Solution of Ergotin, appears in Lloyd's Supplement to the American Dispensatory. In this process the crude ergot is extracted with water acidulated with tartaric acid, which is *irrational*. Moreover, the amount of alcohol used in precipitating the aqueous solution is *too* great (70 per cent.) being even more than Hager employs, that all the *scleromucin* and part of the *sclerotic acid* is in danger of being thrown out of solution. Further, to the finished preparation salicylic acid is added to preserve it from change, which is not desirable. After a series of experiments the writer has come to the conclusion that the gummy matter is precipitated with 25 per cent. of alcohol, and as this is all that is necessary to free the liquid from, the employment of more spirit would not be desirable in administration, or entail redistilling, and what is of greater importance the *scleromucin*, which ranks second in medicinal value of all the constituents of ergot, would not be represented in the preparation. The previous exhaustion of oil, and especially the alcoholic extractive, favors the easier precipitation of the inert matter with a small percentage of alcohol.

In the commencement of this paper the different methods in preparing ergotin were referred to as indicating the conflicting views held by the various framers of the processes for its preparation. The subject had received scarcely any attention till C. Lewis Diehl's article in the "American Journal of Pharmacy" of Nov., 1881. Mr. Diehl points out the indefinite instructions in Bonjean's original process, in regard to the amount of alcohol used in the precipitation, making also comparative experiments with Carles' and the formula official in the German pharmacopœia. The fact that no difference in yield of ergotin resulted between Carles' and Bonjean's method, in which 77 and 65 per cent., respectively, of alcohol was used, may be accounted for on the theory that

all the scleromucin had been precipitated when the alcoholic strength had reached 65 per cent., and that no further precipitation took place to any great extent, till the sclerotic acid is thrown down, which does not commence till the alcoholic strength reaches 80 per cent. The large yield of ergotin obtained by Mr. Diehl by the method of the Phar. Ger. is accounted for by the fact that the alcoholic strength did not exceed 30 per cent., and the preparation contained therefore *all* the *scleromucin* and a great proportion of oil and resinous matter, which are not precipitated till the alcoholic strength reaches 40 per cent. The presence of oil was also shown by the fluidity of the preparation and the resinous matter by its color. An ergotin of firm pilular consistence cannot be obtained by these methods unless the ergot is previously extracted with benzin and, still better, subsequently with strong alcohol. The extraction of oil and resin (?) is not advocated on the ground *alone* of rendering the ergot more readily extracted by water, although free from oil, the drug is more readily disintegrated as it lacks that horny surface, but *more* on account of that the *ergotin* will be more concentrated and of better *consistence*.

SCLEROTIC ACID.—In preparing some sclerotic acid, an opportunity presented itself to determine whether the *purified ergot* was more readily exhausted with water than the crude drug. Ten pounds of purified ergot was macerated and expressed with three times its weight of water in three equal portions, the liquid concentrated to five pounds and alcohol added to bring the mixture to 50 per cent. and filtered. The filtrate was concentrated to a syrup in consistence and alcohol added to make the liquid of 85 per cent. alcoholic strength. The sclerotic acid was quickly precipitated and obtained quite pure after washing with 85 per cent. alcohol. It was of a slate color, but soon turned brown. Ten pounds of crude ergot in coarse powder was macerated for twelve hours with water, packed in a percolator and eight pints of percolate obtained, again macerated and a second similar quantity of liquid received, alternate maceration and percolation was enforced till the drug was exhausted, which was scarcely accomplished when thirty-two pints of fluid had been recovered. When the orifice was opened after the second maceration quite an explosion took place, indicating the formation of carbonic acid gas and the process must therefore be watched. The liquids obtained were treated in the same manner as above, nearly twenty-five per cent. of matter being precipitated and rejected; when the alcoholic strength reached eighty-five per

cent. the sclerotic acid was thrown down, but so contaminated with resinous matter that subsequent washing with alcohol failed to purify it; comparative estimation of the acid was therefore abandoned. Ergotin is largely used in pills and prescribed in pretty large doses, it is therefore desirable to have a preparation of firm consistence and as concentrated as practicable. The following formula is therefore proposed as yielding a product possessing these advantages. The purified ergot as above is exhausted with water as in the preparation of fluid ergot, and the liquid evaporated till one-half the volume of the ergot used, alcohol is added to twenty-five per cent., after standing filtered and the filter washed with twenty-five per cent. alcohol. The alcohol is recovered and the aqueous solution evaporated to pilular consistence. The yield is about fifteen per cent. of the drug used. This ergotin will be found to keep well, it is not very hygroscopic and one grain represents about six grains of ergot. It can be mixed with sugar-of-milk in various proportions, when of hard consistence and the desiccation completed until it is sufficiently brittle to be triturated to a fine powder. By adding sufficient sugar-of-milk to replace the inert matter of the drug, namely eighty-five per cent., saccharated extract of ergot is obtained. It was on account of the difficulty experienced in preparing this in a powdered form, which led the writer to extract the fat primarily from the drug. By adopting this procedure all impediments are removed to obtain an extract in the powdered form with even less proportion of sugar-of-milk than the above.

In conclusion, the writer will state that there is no doubt that this extraction of fat from crude drugs with a cheap solvent like benzin can be carried on to a considerable extent, and the extract subsequently obtained can be reduced to, and preserve its pulverulent condition without difficulty, rendering the admixture of absorbent powders in such *great* and *deceiving* proportions unnecessary. But great care should be exercised that the active principles of the drug are not also *even partially* extracted. The extraction of fat, in nux vomica, with benzin, seems, according to some authorities, coupled with danger of dissolving some of the alkaloids, although the writer thinks this is due *more* to an excessive use of the solvent employed. In order to extract the fat from a drug by benzin it is not necessary to have it in fine powder, nor subject it to the action of the solvent by long maceration, as the fat is rapidly taken up. In the main an equal portion, volume for weight, of the benzin is sufficient, and this can be lessened by increasing the

height of the column of the drug operated on. With ergot, however, no precaution is necessary, as the alkaloid is sought to be discarded, and the benzin has no action on sclerotic acid of scleromucin.

THE JAPANESE PEPPERMINT PLANT.

By E. M. HOLMES, F.L.S.,

Curator of the Museum of the Pharmaceutical Society of Great Britain.

When examining some leaves of this plant, presented, together with a series of Japanese drugs, to the Museum of the Pharmaceutical Society, by Messrs. Christy & Co., in 1879, I thought it desirable to compare them with those of the plant which is stated to yield the Chinese oil of peppermint. Through the courtesy of the keeper of the Kew Herbarium, I was permitted to taste a fragment of a leaf of the Chinese plant and one of Blume's specimens of *M. arvensis*, L., var. *Javanica*, the plant to which this peppermint is referred in "Pharmacographia." To my surprise I found that neither Blume's specimen nor any others of the same plant from various localities had the taste of peppermint, but possessed a flavor similar to that of the garden mint (*M. viridis*). Judging that the Japanese plant could not belong to *M. arvensis*, var. *Javanica*, I referred to the Japanese work "Zo Mokou Zoussetz," in which the Japanese peppermint plant is stated to be *Mentha arvensis*, var. *vulgaris*, Benth. On tasting the type specimen of this plant at Kew, I found that this also did not possess the taste of peppermint, but only that peculiar to European specimens of *M. arvensis*. I therefore wrote to China and Japan for specimens of the peppermint plants of those countries. After the lapse of more than a year, Mr. C. Ford, the Director of the Botanical Gardens at Hong Kong, was able to procure a flowering specimen of the Chinese plant for me, but no specimens of the Japanese plant could be procured by my correspondents. Mr. T. Christy, however, after having first obtained seeds of the plant, attempted to grow them, without success, but was ultimately, and after considerable difficulty, able to procure from Japan living plants which flowered this year in his garden at Sydenham, and a specimen of the plant was exhibited for the first time, I believe, in this country, at the meeting of the Pharmaceutical Conference, at Southampton. On careful examination, both the Chinese and Japanese plants thus obtained were found to possess the botanical characters of *Mentha arvensis*, as defined in De

Candolle's "Prodromus;" the leaves being stalked, ovate lanceolate, and the hairs on the stems and pedicels reflexed, those of the calyx being erecto-patent, and those of the upper surface of the leaf appressed, the calyx being bell-shaped with acute lanceolate or narrowly-triangular teeth. The Chinese plant differs from the Japanese one in the leaves being narrower in proportion to their length and in the calyx teeth being shorter and more broadly triangular. In outline, the leaves of both plants taper more to the base and have a longer petiole than the English forms of *M. arvensis*, coming very near to *M. canadensis* in this feature. The latter plant however, has spreading hairs on the stem. The Chinese plant appeared to so nearly resemble *M. canadensis*, var. *glabrata*, that I applied to Professor Asa Gray for specimens of that species for comparison. The specimens of *M. canadensis* which he kindly forwarded to me were derived from different localities in the United States, and varied considerably in taste and appearance, some having the flavor of pennyroyal, others that of *M. viridis*, and others again that of peppermint, in a feeble degree. The specimen having a peppermint flavor is labeled *M. canadensis*, var. *glabrata*; it has reflexed hairs on the stem, and differs from the typical plant in having more triangular and shorter calyx teeth, which, as well as the petioles, have erect hairs; in fact, it appears in every respect to be the same plant as that grown at Canton. It is not surprising, however, to find Japanese or Chinese plants extending to North America.

It appears, then, that there are two plants possessing a widely different taste and both referred to *M. arvensis*, var. *Javanica*, by botanists. This might lead to confusion if the Chinese or Japanese peppermint plants ever came into demand for purposes of cultivation, unless a special name be given to the form which possesses the peppermint flavor, even although it does not possess characters sufficiently definite to separate it from *M. arvensis*. The mints are well known to form an uninterrupted series of plants which it is difficult to separate into species. Deeming it advisable, therefore, before giving it a name, to consult those botanists who have critically studied the mints, specimens of the Japanese peppermint plant were forwarded to several authorities on the genus, and the following opinions have been expressed: Mr. J. G. Baker, of the Kew Herbarium, considers it to be a form of *Mentha sativa*, Sm. (It may be here remarked that this form, as recognized by Hooker and Babington in their "British

Floras," is a species differing from *M. arvensis* in the smaller upper leaves and longer calyx teeth, while De Candolle includes it under *M. arvensis*.) Professor Baillon, of Paris, expresses the opinion that it must be referred to *M. arvensis*, var. *Javanica*, unless it be a hybrid between *M. arvensis* and *M. piperita*. Dr. Gareke, of Berlin, finds the plant to be nearly allied to *Mentha canadensis*, D.C., and also to *M. aquatica*, var. *subspicata*, D.C. Dr. Franchet, one of the authors of the most recent "Flora" of Japan, believes the Japanese plant to be "a form of *M. arvensis*, characterized by the acuminate calycine segments, a feature which constantly occurs in specimens from eastern Asia." He adds, "After carefully comparing your specimen and having vainly sought an analogous taste in the different forms of the *M. arvensis* of Europe, I have found in them only an insipid and herbaceous flavor; I can say the same of *M. arvensis* from the neighborhoods of Pekin and Chefu, in the province of Shantung, and from the neighborhood of the lake Sitau, in the province of Sche-kimy; but I find the taste of peppermint developed in a very high degree in a specimen gathered at Voosung, near Shanghai. From Japan I possess specimens of *M. arvensis* gathered in very many localities, and I have found the taste of peppermint in all my specimens, without exception. This taste is absolutely the same as that furnished by your plant. I remark, however, that the taste is more pronounced in proportion as the plants are more robust; puny specimens with small leaves from Kanasawa (in Nippon) possess it only in a feeble degree." He thinks that the peppermint flavor is not the result of hybridity, since no other species has hitherto been observed in Japan, either in a cultivated or wild state, except *M. crispa* ("So Mokou Zoussetz," xi, pl. 29) (which no botanist, that he is aware of, has ever brought back from that country), and *M. gentilis*, which is well delineated under the name of *M. arvensis* on the same page as *M. piperita*, after information probably furnished by the Dutch. M. Malinvaud remarks that the name *piperita* cannot be appropriated to the Japanese plant, as it is already applied to a form of *M. arvensis* with flower spikes. He therefore suggests the name *Mentha arvensis*, var. *piperascens*.

The weight of opinion is, therefore, on the side of considering the Japanese plant as a form of *Mentha arvensis*, D.C. If *M. sativa*, Lin., and *M. arvensis*, as defined by Babington, as well as *M. Javanica*, D.C., are to be considered as forms of one species, then the Japanese plant might, I think, also rank as a form under the name of *M. arven-*

sis f. piperascens, differing from *M. arvensis* as described by Babington in having the calyx teeth longer than broad, and in the upper leaves being gradually smaller; from *M. sativa*, in the leaves having longer stalks and tapering below; from *M. Javanica*, in the uppermost leaves being more than twice (usually six or eight times) as long as the verticillasters, and in the veins being hairy on the under surface of the leaf whilst those on the calyx are erecto-patent; and from *M. canadensis*, in the reflexed pubescence of the stems.

With respect to the Chinese peppermint plant, it so exactly agrees with the specimen of *Mentha canadensis*, var. *glabrata*, furnished to me by Dr. A. Gray, that if the latter be a typical specimen¹ I can only consider that it should be referred to *M. arvensis*, under the name of *M. arvensis*, var. *glabrata*.

Dr. Gray's specimen has the calyx teeth much shorter than those of the typical *M. canadensis* sent at the same time, and the hairs on the stem and pedicels are reflexed, while those of the calyx tube are erecto-patent.

There are some other points in connection with peppermint which are extremely suggestive, and to which I desire to call the attention of those who have greater ability and more time for investigation than myself.

A number of varieties and forms of so-called species possess the same odor and flavor, as shown in the following list:

Mentha piperita, *Mentha arvensis*, var. *piperascens*, *M. canadensis*, var. *glabrata* (!), and *M. incana* (!), cultivated near Bombay for producing peppermint oil (Dymock).

Spearmint, *Mentha viridis*, L., *Mentha sylvestris* (!), *rotundifolia* (!) *sylvestris* (!), *canadensis* (!), *M. arvensis*,² var.

The questions then arise:

1st. Do the oils of these species differ among themselves, as has been shown to be the case with those of *M. piperita* and *M. arvensis*, var. *piperascens*?³

2d. If so, is this difference dependent on degree of development, on climate, soil,⁴ or sex?

¹ Dr. Franchet notes, in his "Flore du Japon," the reflexed leaves in some specimens of *M. canadensis*.

² Those marked (!) have been tasted by myself.—E. M. HOLMES.

³ "Pharm. Jour." (3), ii, p. 321.

⁴ Mr. J. Lloyd found a variety of *M. aquatica* possessing a lemon odor on calcareous soil near the sea, and M. Malinvaud a specimen of *M. arvensis* with a lemon odor in a ditch near Ivry, where other plants of the same species possessed only the usual odor of the plant.—*Bull. Soc. Bot.*, 1881, p. 370.

3d. Is the oil in each case a mixture, in which one ingredient is present in variable quantity in the different plants?

4th. Do the oils of spearmint and peppermint bear any chemical relation to each other?

5th. Which species, containing the oil of peppermint, yields the largest quantity and which the most valuable one for medicinal purposes?

To recapitulate: The writer would recommend that for convenience the name of *Mentha arvensis f. piperascens* should be retained for the Japanese peppermint plant and that of *Mentha arvensis f. glabrata* for the Chinese one.—*Phar. Jour. and Trans.*, Nov. 11, 1882.

ON THE ESSENTIAL OILS.

BY DR. AUGUST BELOHOUBEK.

Freshly distilled oil of turpentine contains no oxidized products, and hence no resinous matters, for, owing to their slight volatility, they remain behind in the retort; while an oil that has been kept in open vessels absorbs oxygen from the air and hence contains a resin.

Various observations have forced us to the view that substances composed of carbon, hydrogen, and oxygen mix with other liquids—that is, mutually dissolve each other more easily the more similar they are chemically. The exceptions to this rule are very few.

If we apply this rule of the mutual solvent power of allied substances to the oil of turpentine recently distilled, we can predict that, being a hydrocarbon, it will dissolve easily in other hydrocarbons; and the more readily the more nearly the hydrocarbon series to which they belong are related to each other, and the less they differ in the number of carbon atoms in the molecule.

But how will it be with the old, oxidized, and hence resinous oils which contain but a few per cent. of resin. Such resin differs from the oil, $C_{10}H_{16}$, in containing one or two atoms more of oxygen, and one or two molecules of water, so that it is tolerably similar to the pure oil and soluble in it; but it differs considerably from other hydrocarbons, especially if they contain but little carbon and comparatively more hydrogen in the molecule, and therefore do not readily mix with it. This supposition was confirmed by experiment. I selected as a cheap reagent the petroleum ether which boils at about 104° Fahr. (40° C.), and is a mixture of pentanes, C_5H_{12} , etc. Fresh oil of turpentine mixes

in all proportions with this naphtha, and the mixture remains clear, while lumps of resin separate from the old and oxidized oil.

This experience induced us to extend the experiments to other essential oils similar to turpentine, and it was expected that oil of lemon, of orange peel, and of juniper would act in the same way towards petroleum ether.

Experiment confirmed this expectation. Not merely the oils named, but many other fresh oils could be distinguished in this way from older oils, viz., the oil of aniseed, fennel, peppermint, mint, and rosemary. Beside these I also tried old *oleum carophyllorum*, *carvi*, *macidis*, *cinnamomi*, *salviæ*, *serpylli*, and *thymi*, but could not compare the results with those of fresh oils of the same kind because I had none of the latter on hand.

I consider such experiments very useful, and recommend any one who has an opportunity, whether apothecary or oil manufacturer, to test the action of other oils toward petroleum ether and publish his results.

The experiment is performed by dropping one drop of the oil into a dry test tube, and then a drop of naphtha, and observing whether the mixture remains clear or becomes turbid. After we add two, then three and more drops of naphtha, and can be certain whether a white precipitate or a milky turbidity, or even an opalescence results from the presence of a resin.

When old oil of anise was used it did not mix with naphtha, but the fresh oil was miscible in every proportion. Oil of orange gave a turbid mixture; oil of lemon, the resin was deposited on the side of the test tube; oil of fennel only partially dissolves when old; oil of juniper forms white lumps; oil of peppermint becomes turbid; while oil of rosemary scarcely mixes at all. Fresh oil of turpentine, after standing open a week or two, becomes turbid. If alcohol is added to the oils the reaction will not take place.—*Chem. Jour.*, Nov. 10, 1882; *Liqueur Fabrikant*.

On Halogen Derivatives of Chinolines. W. La Coste.—

The author prepares these derivatives in a manner differing from the original of Skraup, 86 grams of bromaniline and the corresponding quantity of glycerin, sulphuric acid and nitrobenzol are carefully heated. The product was distilled with steam after diluting with water. The residue contained 70 grams of pure monobromchinoline. Dinitrochinoline and phenylchinoline were prepared by similar methods.—*Jour. Amer. Chem. Soc.*, Nov., 1882; *Berichte*, xv, p. 557.

ACTION OF HYDROGEN PEROXIDE ON ORGANIC MATTERS AND FERMENTATIONS, AND ON ITS EMPLOYMENT IN SURGERY.

MM. Paul Bert and P. Regnard have studied the action of hydrogen peroxide upon various forms of organic matter and upon fermentations, and find that it possesses very remarkable antiseptic properties. All fermentation due to an organized ferment is immediately and definitely arrested by hydrogen peroxide, the ferment is killed, and even after the removal of the hydrogen peroxide by one of the substances which destroys it most rapidly, the fermentation does not recommence. The yeast of beer is in this manner killed instantly, although it possesses itself the property of decomposing hydrogen peroxide. Specimens of wine, urine, and milk, each containing a few drops of hydrogen peroxide, have been exposed for several months in open vessels without exhibiting the least sign of alteration, while other specimens of the same identical liquids, without the addition of hydrogen peroxide, placed beside them, were in a state of complete decomposition. Although organized ferments are destroyed by hydrogen peroxide, soluble ferments do not seem to be affected by it, saliva, diastase, the gastric and pancreatic fluids continue to act in solutions containing hydrogen peroxide. MM. Bert and Regnard have also studied the action of hydrogen peroxide upon various organic materials, including the albuminoid substances, and all the tissues composing the animal body in a healthy or pathological state. The results of their investigations may be summed up as follows:

1. Hydrogen peroxide, even when very dilute, arrests fermentations due to the development of living organisms, and the putrefaction of all substances which do not decompose it.
2. It has no effect upon diastase fermentations.
3. Dilute hydrogen peroxide is not destroyed by fats, starches, soluble ferments, egg albumen, casein, the peptones, creatine, creatinine or urea.
4. It is rapidly destroyed by nitrogenous collagens, by musculin, fibrin of the blood, and various nitrogenous vegetable matters.
5. This action is definitely arrested by a temperature above 70°. Putrefaction, however, leaves it entirely intact.

As it appeared from the powerful antiseptic properties of hydrogen peroxide that it might prove of value in surgery, experiments were

made upon the point by MM. Péan and Baldy at the hospital of St. Louis, with very successful results.

The hydrogen peroxide, in solutions containing from two to six times its volume of oxygen, according to the circumstances of the case, was used, both externally, as a dressing for wounds, ulcers, etc., and also given internally in certain affections, in doses of from three to five grains, containing six times its volume of oxygen. As a result of their experiments MM. Péan and Baldy consider themselves justified in stating:

1. Hydrogen peroxide containing, according to circumstances, from two to six times its volume of oxygen, appears to be capable of advantageously replacing alcohol and carbolic acid.

2. It can be employed externally, for the dressing of wounds and ulcerations of all natures, in injections and in vaporizations, and internally.

3. The results obtained, even in the case of the largest operations, are, up to the present, in the highest degree satisfactory. Not only fresh wounds, but also old ones, proceed rapidly to cicatrization, and reunion by first intention of amputation wounds appears to be encouraged by this mode of dressing.

4. The general as well as the local state appears to be favorably influenced.

5. The advantages of hydrogen peroxide over carbolized water are its not having any poisonous effect nor unpleasant odor, while its application is entirely painless.

M. Bert calls attention to the fact that hydrogen peroxide for surgical use must be entirely neutral, while that obtained from the greater number of dealers in chemicals frequently contains a considerable quantity of sulphuric acid, so that its use would not be without danger. —*Amer. Chem Jour.*, from *Comptes rendus*, 94, 1383, and 95, 49.

DISINFECTANTS.

In an article on disinfection Dr. R. Koch remarks that the only substances worthy of the name of disinfectants are chlorine, bromine, iodine, mercuric chloride, and perhaps potassium permanganate and osmic acid. He finds that spores of the bacillus of splenic fever, kept for many days in 5 per cent. zinc chloride solution, develop when

placed in suitable nutritive liquids, even when added to serum containing $\frac{1}{2}$ per cent. zinc chloride. He wonders how this salt could ever have been regarded as an antiseptic.

Fr. Boillat, in criticising Koch's article, calls attention to the fact that for a substance to be an antiseptic it is not necessary for it actually to *destroy* germs. In the antiseptic treatment of wounds it would be impossible to employ such violently acting substances as those mentioned by Koch. All that is necessary is the presence of substances capable in some way of restraining the development of germs, which hence may properly be called antiseptics. Many antiseptics have the power of coagulating proteids. Boillat prepared such coagula from serum and egg albumin by precipitating with phenol, zinc chloride, copper sulphate, and mercuric chloride. These albuminates, after being well washed to remove any excess of the precipitant, were mixed with a little water and exposed to the air. Pure serum and Koch's gelatin served to control the experiments. In the serum, gelatin and phenol-albuminate, bacteria appeared in 1, 1, and 2 days respectively, and marked putrefaction in 2, 4, and 6 days respectively, while in the metal-albuminates bacteria did not appear until from 31 to 45 days, and marked putrefaction in from 46 to 60 days. The surprisingly rapid putrefaction of the phenol-albuminate was explained when it was found on examination to contain no phenol. Splenic fever spores were found to develop in gelatin in 1 day, and not at all in metal-albuminates. According to Boillat, Koch did not add enough zinc chloride to his serum to convert all the proteids into the harmless but innutritious zinc-albuminate, and the spores availed themselves of the excess. Applied to the surface of a wound, zinc chloride forms a superficial coating of the neutral zinc albuminate, which affords no means for the bacteria to develop, and protects the parts under it.

Experiments with iodoform (2 per cent. sol.): carbon tetra-chloride, CCl_4 ; the chlorides C_2Cl_4 and C_2Cl_6 , and bromo-toluene (liquid and solid), and dimethyl-pyrogallol (1 per cent. sol. each), as restraining putrefaction of pancreas, gave negative results, and para-cresol was active only in solutions of at least $\frac{1}{2}$ per cent., and even then did not restrain the action of the pancreatic ferment.—*Amer. Chem. Jour.*, from *Journal für praktische Chemie* [2], 25, 300.

ON BISULPHIDE OF CARBON.

BY L. H. FRIEDBURG, PH. D.

Several years ago I published some notes on bisulphide of carbon ("Berichte d.d. ch. Ges.," viii, 1616) to which I shall add to day a few more observations. Then and there I showed how to clean the bisulphide by means of fuming nitric acid, and that the vapors of nitrous acid, of nitrogen dioxide, of sulphurous acid, etc., etc., were taken up and invariably retained by the bisulphide. Dry bisulphide of carbon serves as a very good conveyance for the reaction of such gases and vapors in a dry state on each other and on other substances. The only disagreeable feature in this regard is that carbon bisulphide in most cases also enters the reaction, forming very undesirable products, and sometimes only such, sulphur containing, products are formed, in any notable quantity. The following reactions are the only three I wish to mention, as they may prove germs for further investigations.

1. Bisulphide of carbon charged with the vapors of nitrogen dioxide and then mixed with pure benzol, forms amongst other products large, broad crystals of dinitro-benzol, melting at $+86^{\circ}\text{C}$. These crystals are formed after standing a considerable time, and after the partial evaporation of the mixed liquids at summer heat.

2. I think that great interest is attached to the reaction of the aforementioned liquids in direct sunlight. The brown vapors begin to disappear without escaping from the narrow neck of the very large flask, in which such experiments take place, and in proportion as they disappear, small white crystals begin to cover the sides of the flask within. This covering principally takes place above the edge of the liquid on the bare glass. The crystals could not be analyzed, because they decomposed when brought in contact with air, yielding then NO_2 and benzol. It is not entirely out of the way to suppose that in this case addition products formed, analogous to benzol-hexachloride $= \text{C}_6\text{H}_6\text{Cl}_6$, so that the white crystals in this case might be either $\text{C}_6\text{H}_6(\text{NO}_2)_4$ or $\text{C}_6\text{H}_6(\text{NO}_2)_6$, which of course needs further investigation.

3. A very pretty reaction takes place when bisulphide of carbon charged with dry sulphurous acid gas, and the same medium charged with nitrogen dioxide (which was not free from nitrous acid) are brought together. This reaction might be used as a lecture experiment. Keeping the vessels cool and dry (I generally use a spacious beaker) white crystals very readily form in considerable quantity,

which, in fact, are nothing but lead chamber crystals. This reaction treated analytically may some day throw new light on the formation and composition of lead chamber crystals.

The bisulphide of carbon cleaned by means of fuming nitric acid is the only chemically pure I came across, and I therefore proceeded to determine its specific gravity as well as boiling point, without finding though any differences from any former determinations.

The specific gravity at $+15.2^{\circ}\text{C}$ is 1,266, and the boiling point $+47.4^{\circ}\text{C}$, at 0.760m pressure.

The pure bisulphide shows materially no other so-called physical properties than those known heretofore.

Finally I want to state, that in treating raw bisulphide of carbon, coming from the retorts of manufacture, with fuming nitric acid, I could invariably detect mononitrobenzol in the residue of evaporation, which leads me to believe that amongst the numerous products formed in the red hot retorts, particularly if the charcoal was not dry enough, there is also benzol.

2. The purifying influence of a non-colored and inodorous fat, for instance such as the oil of African palm kernels, good as it is for the bisulphide of carbon, becomes a nuisance when this latter is used as a means of extraction of the former. I advise, therefore, from long experience, all those who extract fats (particularly if it is for manufacturing) by means of CS_2 never to use an excess of this latter, and never to let a new mixture of oil and bisulphide run into the still in which oil already freed from bisulphide is retained. This latter will else be rendered impure.—*Jour. Amer. Chem. Soc.*, November, 1882.

THE ADULTERATION OF OLIVE OIL.

BY CH. MARIE.

The oils which are commonly used to adulterate olive oil are very few in number. Among the most important are the colza oil, sesame oil, cottonseed oil, and peanut oil.

1. Colza Oil.—Independent of the conventional methods known, the presence of this fraudulent admixture may be easily detected by means of the sulphur contained in the cruciferous seeds which must be offered as evidence. For this purpose, ten grams of the oil to be tested are saponified in a glass capsule, by means of an alcoholic solution of potassium hydrate (caustic potash) freed from hydrogen sulphide. The

mixture is then agitated with a silver spatula which becoming black indicates the presence of an oil from one of the cruciferous plants, containing sulphur.

2. Sesame Oil.—To the oil which is to be examined there is added equal parts of hydrochloric acid of 23° , then strongly agitated. The presence of the sesame oil is shown, no matter how small the quantity is, by a red coloration which is produced and remains, when allowed to rest, at the bottom of the liquid.

3. Cottonseed Oil.—To the suspected sample of oil there is added an equal volume of nitric acid of 40° . When the mixture is strongly agitated it assumes a *café au lait* color, more or less dark.

4. Peanut Oil.—The presence of this adulterant is difficult of detection, but if the operation is slightly complicated the fraud is not of frequent occurrence on account of the disagreeable taste of the product. In this case the oil to be examined is treated by an alcoholic solution of potassium hydrate. The saponified mass thus obtained is heated in order to drive off the alcohol, then it is treated with a quantity of hydrochloric acid sufficient to neutralize the potash. The fatty body which floats on the surface is arachic acid. This is collected and dissolved in boiling alcohol from which, when cooled, the arachic acid is thrown down as a white mother-of-pearl precipitate, which is readily recognized.

Such are the ordinary tests that are used in the municipal laboratory at Marseilles for the detection of adulterations in olive oil. To the above we add a few other adulterants giving the ordinary and easiest methods for their detection.

The adulteration by poppy oil is of quite frequent occurrence in the north of France, on account of the cheapness of this article; its neutral and soft taste makes its presence almost unnoticeable in a fraudulent mixture.

A good test, based on the difference of the viscosity of the two oils, consists of the introduction with rapid agitation of bubbles of air into the suspected oil. If it is pure, the bubbles will quickly pass off. In the contrary case, they go to the surface, and there they remain during a greater or shorter period, forming a wreath.

If the mixture is heated to boiling, the poppy oil becomes covered with an abundance of froth, a circumstance which does not happen to pure olive oil. The freezing by means of a refrigerating mixture likewise offers a method of testing. The pure olive oil freezes between

+6° and +8°. Poppy oil, on the other hand, does not solidify till -8° to -12°, forming an opaque whitish mass.

Olive oil mixed with peanut oil at plus 8 deg. deposits particles resembling grains of sand, which sink to the bottom of the vessel, leaving the upper liquid perfectly clear; whereas when olive oil is cooled down to +4, it concretes, and the particles remain suspended in the liquid.

Sulphuric acid is likewise of value in recognizing the purity of olive oil.

If a drop of sulphuric acid, marking 66° Baumé, is added to ten or fifteen drops of oil in a colourless glass over a sheet of white paper, after a short while a coloration is developed, which varies according to the kind of oil examined.

Olive oil: light yellow, turning into yellowish green.

Poppy oil: canary yellow, then a dull yellow.

Peanut oil: yellow, dirty gray.

Sesame oil: bright red.

The adulteration of olive oil by means of honey is practiced, more especially in Provence. For its detection the suspected oil is treated with water, then evaporated; after which the oleaginous portion is separated from the part dissolved by the water. This then has a sweetish taste which it does not have when in contact with pure olive oil, thus proving it to be of totally different origin.—*Chemists' Jour.*, Nov. 3, 1882; *Jour. des Connaissances Utiles*, vi, 129 and 158.

THE KOLA-NUT TREE.

BY THOMAS CHRISTY, F.L.S.

I introduced the Kola Nut (*Stereulia acuminata*) into England about eight years since, and it has lately been subjected to European analysis,¹ and the results obtained made it exceedingly likely that a large European demand will soon exist. It has been found to contain the same active principle, viz., caffeine, and more of it than the best coffee, and to contain also the same active principle as cacao, but less fatty matter. Possessing the same qualities as these favorite beverages, it only needs proper treatment to develop a special flavor, and it would then probably be able to compete successfully with those beverages. The nuts are used to form a refreshing and invigorating drink throughout a large portion of tropical Africa, their use being said to support the strength, allay inordinate appetite, assuage thirst, and promote

¹ See "New Commercial Plants," Nos. iii and vi.

digestion, and to render those using them capable of prolonged fatigue. The negroes prefer them to tea or coffee, and when they can obtain Kola nuts, will not touch coffee. Dr. Daniell says of them: "It would be difficult to find any product which constitutes such an important article of commerce in Soudan as the Kola nut." Wherever the negro has been transplanted to a foreign country he has taken the Kola nut with him.

As a medium of exchange for the products of Central Africa no article could be more advantageous, and on this account alone the tree will well repay cultivation. Moreover, if once introduced as a beverage in civilized countries, the demand for it would soon become enormous.

I have recently been informed by Mr. Espeut, a well-known sugar planter of Jamaica, that the negroes use the Kola nut as a remedy for drunkenness; that swallowing a single nut, ground up and made into cream or paste with water or spirit, no sign of intoxication remains half-an-hour afterwards.

Confirmatory evidence of this property in the Kola nut is given by a surgeon, Mr. Papefio, who tells me that alcoholic drinks do not produce intoxicating effects when the Kola nut is eaten at the same time.

It appears, therefore, that the craving for drink, which is such a strong incentive to drunkenness, may be subdued by the use of this valuable stimulant and tonic, as after chewing Kola nut great disinclination is felt to all forms of alcohol. It has also been found to possess a beneficial action on the liver, its continual use preventing attacks of despondency to which negroes are peculiarly liable. Dr. Daniell records a case of this kind, in which the Kola nut put a stop to an epidemic of suicidal mania, which threatened at one time to depopulate the estate on which it occurred.

It is also used by the natives when in a low state of health, suffering from the skin cracking and peeling on the hands and feet.

I have just received from a native gentleman on the west coast of Africa a fair quantity of fruit in splendid order, as fresh as if just gathered from the tree.

Planters will be able to send them off for seed at once to their estates.

Some have been sent to the leading medical men in London for further experiment, and I am endeavoring to ascertain the best plan of preserving their medicinal properties.—*Chemists' Journal.*

RESEARCHES UPON THE JALAPS.

BY A. BOURIEZ.

In commercial specimens of any kind of true jalap (tuberous, fusiform, or Tampico) several varieties of tubercules can be distinguished by their external characters. Those which constitute the greater part of the jalap, and which I designate under the name of "typical tubercules," always present at one of their extremities (the upper) the remains of aerial organs. Sometimes they terminate in a point at both their extremities; sometimes one of the extremities only becomes slender, whilst the other presents a large surface of insertion. There are met with, besides, tubercules inserted on other tubercules, and very small fragments [*grabeaux*] showing tubercules inserted upon an organ which is most frequently slender and cylindrical, but sometimes fusiform and more or less swollen. The question presented itself to me, whether these tubercules of the different varieties answered to variations in appearance of one and the same organ, or whether they represented organs of a different morphological nature.

An examination with the naked eye, and aided by a glass, of transverse sections made at different points of these tubercules, yielded me some useful information, but not sufficient to answer the question with certainty. I then submitted the same sections to a microscopical examination.

As a basis for this micrographic study I selected a typical tubercule of the tuberous or official jalap.

A transverse section made at the lower extremity of the tubercule enabled me to conclude that the organ there presents the structure of a root. Towards the centre of the section there were observed four primary woody layers, symmetrical around the centre, and convergent in pairs. Each of these layers is formed of some spiral vessels, the most slender of which are nearest the exterior, the largest being nearest the centre. The differentiation has therefore proceeded in each of these primary ligneous layers from the centre of development (indicated by the most slender spiral vessels) towards the centre of the organ. It may thence be concluded that the centre of the organ is occupied by a single tetracentral primary bundle, the centre of which coincides with the centre of the organ, and it may be inferred from this conclusion that the organ, at this stage, is a root.

Among the histological details presented by this root, I will refer

here only to the formation of the elements of the liber. Among the young cells with tangential divisions belonging to the cambial zone, the most external present very early longitudinal septa, which subdivide them into a number of narrow elongated cells, such as are seen in the *Asclepiadaceæ*, *Apocynaceæ*, *Solanaceæ* and *Acanthaceæ*. The transverse septum which separates two superposed cells is reabsorbed, following the meshes of the tissue, and in this way are originated the perforated plates of cells characteristic of the liber. The elements of the cambial zone which do not present these septa make up the liber-parenchyma, in the midst of which occur numerous resiniferous cells and glands containing crystals.

The resin-cells would appear to be parenchymatous elements, hypertrophied and gorged with resin. Generally they are superposed end to end, so as to form rather long vertical rows; but in no case have I observed the reabsorption of the wall common to two successive cells. There is therefore no formation of a canal, and I look upon these resin cells as unicellular glands distributed in the mass of the liber.

The crystal-bearing glands consist of parenchymatous cells, subdivided into as many compartments as they contain groups of crystals. These groups are sphaeraphides of oxalate of lime. A radial section, treated with a mineral acid which dissolves the oxalate of lime, shows readily the subdivision of these glands.

I will now briefly sketch the structure of the part of the tubercule comprised between the lower extremity and the point which corresponds to the maximum volume of the organ, setting forth the mechanism of the formation of the tuber.

In sections which follow those which presented the structure of a well-characterized root, there is observed, in proportion as they rise towards the central part of the tuber, the interposition, among the hardened and characteristic elements of the root, of a parenchymatous tissue, supplied at first solely by the cambial zone. The interposition of this tissue, which I will call the "muriform parenchyma," results in separating the woody layers from each other, and quickly interfering with the primitive symmetry of the organ. The spiral layers, carried away and twisted in every direction by the secondary ligneous lobes, quickly disappear, so that at a very short distance from the lower extremity of the tubercule it is already impossible to recognize them.

Higher up the muriform parenchyma which surrounds the indurated

ligneous masses splits up parallel to the surface of these masses, and thus originate true secondary generating zones, which produce, on the side of the wood some rows of muriform parenchyma, and, on the other side, secondary liber, with numerous glands containing resinous and crystalline matter.

In the most swollen parts are seen important layers of muriform parenchyma, divided tangentially in every direction, and furnishing, at the same time, liber products on the one side and parenchymatous elements on the other. All the parenchymatous cells are gorged with starch, and the tubercle constitutes an important alimentary reserve for the plant.

In studying the upper portion of the tubercle I have followed the reverse order, and starting from the upper extremity descended towards the centre.

The transverse section made at the top extremity of the tubercle shows that the organ, at this point, has the structure of a stem. The primary ligneous mass forms, in fact, an annular zone around the centre of the organ, but at a certain distance from the centre. It is formed of radiating layers grouped in badly defined bundles. Each layer of primary wood comprises three or four contiguous spiral vessels disposed radially, the most slender being inside. The differentiation of the primary ligneous elements, therefore, has proceeded from the centre of the development (indicated by the most slender spiral vessel) in a direction which passes by the centre of the organ, but which leaves the centre of development between the centre of the organ and the ligneous layer. The centre of the organ presents, therefore, a central crown of bundles with centrifugal differentiation. From this it may be concluded that the organ at this level is a stem.

Moreover, at the top of the cicatrices, to which I have referred before, is observed the issue of four bundles, in two opposite appendages on each side. At the axil of each of these appendages a bud that is frequently developed is placed between the two bundles in relation with the bundles of the stem. In the interval comprised between the point of issue of the appendages and the swollen middle portion of the tubercle occurs the extinction of the primary ligneous layers of the stem. The organ becomes tuberized in this region by the same process as in the inferior portion.

The extinction of the primary ligneous layers of the stem shows that there is here a lower termination of the principal stem. Therefore,

the stem which forms the upper portion of the typical tubercules of jalap is a principal stem, its inferior appendages are cotyledons, and their axillary buds correspond to creeping branches.

The secondary elements of the stem are in direct continuation with the secondary elements of the root; from this it follows that the root which forms the lower end of the tubercule below is the principal root. The part comprised between the points where the cotyledons issue and the point of insertion of the principal root corresponds therefore to the hypocotyledonous axis.

This investigation allows of the conclusion that the typical tubercules of jalap represent the stock of the convolvulaceous plants which produce them, and that the tuberized portion corresponds to hypertrophy: (a) of the base of the principal stem; (b) of the hypocotyledonous base; (c) of the region of insertion of the principal root upon the hypocotyledonous axis; and (d) of the upper part of the principal root.

I have studied in the same manner the various tubercules of jalap that never present the remains of aerial organs at one of their extremities, and I have in this way recognized that

(1) Most of the varieties of tubercules represent tuberized roots of different orders;

(2) Some tubercules represent subterranean stems, which, having to play the same physiological rôle as the radical tubercules, are tuberized by the same process and present a nearly identical structure.

Finally, comparison of the three commercial kinds has shown me, that in respect of structure there is no difference, however slight, between the different kinds of true jalap.

From the *materia medica* point of view the jalaps are therefore principally formed of tubercules which correspond to the stocks of the convolvulaceous plants that produce them; they include, besides, a certain number of tubercules which represent tuberized roots of different orders; lastly, tubercules are met with derived from tuberized subterranean stems.

I will now add some pharmaceutical observations upon jalap and the resin extracted from it.

In none of the published analyses of jalap is mention made of oxalate of lime, but a microscopic examination and microchemic tests detect it in considerable proportion in the tubercules.

I am unable to accept the opinion of M. Andouard, according to

which the small roots of jalap would be generally more rich in resin than the large tubercles from the same plant. This does not agree with what is revealed by the microscopic investigation, and, moreover, is not in accord with the amounts found by M. Guibourt. Would not M. Andouard consider as "small roots" the slightly tuberized fragments which are met with in the *débris*, which are derived from subterranean stems and which in fact contain much resin?

With the object of adding something new to the results already known, I have extracted the resin, by the Codex process, from nine specimens of jalap. In order to utilize the products of the aqueous macerations involved in this process, I prepared extracts evaporated in a water-bath to a pilular consistence, of which I have given the yield.

	Resin dried at 100°. Per cent.	Aqueous Extract. Per cent.
I. TYPE SPECIMENS OF JALAP.		
Supplied by the "Pharmacie Centrale."		
Tuberous or official jalap,	12.5	38
Light jalap (small specimens),	2.0	35
Digitate major jalap,	7.0	12
Digitate minor jalap,	9.0	11.5
II. PICKED COMMERCIAL JALAP.		
No. 1,	12.5	35
No. 2,	10.5	33
No. 3,	7.5	23
No. 4,	8.0	17
III. DÉBRIS,	8.5	27

It follows from the investigation of different authors that jalap owes its purgative properties to two homologous resinous glucosides, convolvulin and jalapin. I have, however, nowhere met with mention of clinical experiments made with the pure glucosides. Might there not be, if not an alkaloid, as alleged by Hume, at least a principle other than the resinous glucosides, and which has hitherto escaped analysis? If the opinion of La Maout and Decaisne is to be accepted (*Traité général Botanique*) the resin of the *Convolvulaceæ* owes its purgative properties only to the aroma which accompanies it, for the rhizomes lose them when powdered and exposed for a long time to the air, although they preserve the purely resinous principle. The odorous oleaginous substance which floats at the top towards the end of the distillation, when nearly all the alcohol is removed from the tincture

of jalap from which it is desired to extract the resin, would deserve attention from this point of view.

When jalap resin is prepared by the Codex process, and, in following the mode of operation prescribed, the residue from the distillation of the alcoholic liquor is poured into boiling water, the resin precipitated agglomerates under the form of a thick turpentine, which adheres strongly to the sides of the vessel and can only be collected completely with great difficulty. I have found that if, on the contrary, the residue from the distillation be poured into well-cooled water, the precipitated resin will remain on the sides of the vessel in a very divided form; the resinous particles are separated one from another by drops of water, and it is very easy to collect the product with the aid of a flexible spatula. Upon placing all the resin together in a small capsule the water gradually floats to the top whilst the resinous particles agglutinate.

Finally, I have compared, in respect to yield, the Codex process, which gives an odorous greenish-brown resin, and M. Nativelle's process, which gives an inodorous resin, as white as starch. The following are the results I have obtained :

	Codex process.		Nativelle's process.	
	Resin.	Extract.	Resin.	Extract.
No. 1,	7	11.5	3.0	9.0
No. 2,	12.5	33.0	6.0	27.0
No. 3,	7.5	23.0	3.3	17.0

This enormous difference in the yield of resin is due to the use of 65° alcohol, as recommended by M. Nativelle, which does not dissolve all the resin removed by 90° alcohol, as ordered in the Codex.

It is worthy of notice that more aqueous extract was obtained in evaporating the products of the macerations yielded by the Codex process than in evaporating the products of the decoctions necessitated in following the process of M. Nativelle.—*Phar. Jour. and Trans.*, Nov. 11, 1882; from *Jour de Phar.*

POISONOUS PROPERTIES OF THE JUICE OF THE CASSAVA ROOT.

The sweet cassava (*Manihot Aipi*) and the bitter cassava (*M. utilisima*) are very extensively grown in the West Indies and South America for their edible tubers, much used as a culinary esculent, and for the starch obtained by grating and washing, which is converted

into tapioca. The milky sap of the latter species has long been known to be a strong vegetable poison, which is destroyed through pressing the grated root in the first instance, the remaining acidity being expelled by the heating process.

In 1796 Dr. Clark, of Dominica, describing the fatal effects resulting to negroes from drinking bitter cassava juice, compared the action of the poison to prussic acid, and Dr. Fennon, by experiments made at Cayenne, proved that the poison, like prussic acid, was volatile, and could be isolated by distillation.

Subsequently Messrs. Henry and Boutron-Charlard, by analyzing bitter cassava juice imported into France, ascertained that the poison was prussic acid. In 1838 Dr. Christison confirmed their discovery by an examination of some well-preserved juice from Demerara.

Notwithstanding this early identification of the poison, no attempt had apparently been made to determine the quantity yielded by the plant until 1877, when Mr. E. Francis, F.C.S., undertook an inquiry into the subject, the results of which he has recently published in the journal of the Royal Agricultural and Botanical Society of British Guiana.

An examination was made, not only of bitter cassava, but also of a number of samples of sweet cassava, and, contrary to expectation, the latter were found to contain nearly as much prussic acid as the former. Fifteen samples of sweet Cassava were obtained from different cultivators in Trinidad, and every one of them contained prussic acid, nine out of the number (or 60 per cent.) yielding sufficient, from 1 lb. of the root or half pint of the juice, to kill an adult. The following summary shows the average, as well as the highest and lowest quantities of prussic acid, that were met with in 15 samples of sweet, and 10 samples of bitter cassava:

Sweet Cassava (15 Samples).

	Per cent. of prussic acid.	Grains of prussic acid per lb.
Average,	·0168	1·175
Highest,	·0238	1·666
Lowest,	·0113	0·791

Bitter Cassava (10 Samples).

	Per cent. of prussic acid.	Grains of prussic acid per lb.
Average,	·0275	1·927
Highest,	·0422	3·094
Lowest,	·0132	0·924

The juice of the bitter cassava, mixed with molasses and fermented, has been made into an intoxicating liquor, which is much relished by the negroes and Indians. The concentrated juice, known in the colony of British Guiana as cassareep, is an Indian preparation. One of its most remarkable properties is its highly antiseptic power, preserving meat that has been boiled in it for a much longer period than can be done by any other culinary process.—*Chem. and Drug.*, Nov. 15, 1882.

CRYSTALLIZATION OF ANHYDROUS GLUCOSE FROM ITS AQUEOUS SOLUTION.

BY ARNO BEHR.

In order to obtain crystallized glucose from its aqueous solution nearly absolute ether was employed, glucose being very insoluble in this menstruum until F. Soxhlet found that methylic alcohol is a much better solvent, and that the glucose crystallizes from it in larger and more numerous crystals. The author, however, has proved under certain circumstances that glucose will crystallize out from its aqueous solution by introducing into it small quantities of glucose hydrate crystals; it therefore struck him that the process might be improved upon by introducing a few crystals of the anhydrous sugar into a concentrated solution of the ordinary quality. On the morrow the liquid was found to be full of crystals of the anhydride. The quantity of water in the solution should not exceed from 12 to 15 per cent. The best temperature is from 86°F. to 95°F.

Continuing his experiments, the author found that in order to obtain crystals of anhydrous glucose, it is not even necessary to have recourse to crystals already formed, but that when concentrated solutions were submitted to a high temperature, anhydrous crystals were formed as a matter of course, but that by the addition of a small quantity of the powdered crystals, the crystallization proceeded more regularly and produced a larger crop, their form being prismatic.

[As crystallized glucose is being increasingly used in pharmacy in France, Germany, and America, as a substitute for cane sugar, the discovery ought to be interesting to pharmacists in this country, where it is also being used to a certain extent. A large number of processes have been proposed for the purification and crystallization of glucose, obtained by the action of sulphurous and other acids on starch; but great difficulties have been met with in draining and drying the small

crystals obtained, which obstinately retain the syrup between their laminae, so that it is almost impossible to work with concentrated solutions. If, however, as it is stated by the author, the crystals he obtains are in the form of prisms, and of comparatively large size, the centrifugal process could be used with highly concentrated solutions. It may be stated that the relative sweetening power of anhydrous glucose, as compared with that of cane sugar, is as three to five; in other words, in order to use glucose with economy, it should be bought for less than three-fifths of the cost of crystallized cane sugar.—*Editor of the Chemists' Journal.*

NOTE ON ASBESTOS FILTERS.

BY P. CASSAMAJOR.

An extensive dealer in wares used by chemists lately informed me that he had many inquiries concerning asbestos for filtering liquids in chemical analysis. Some chemists complain that they cannot get clear solutions through asbestos, while others, who obtain clear solutions, find that their liquids filter altogether too slowly.

Allow me to recall that the method of making asbestos filters by pouring a thin paste of this material over a perforated platinum disc was first proposed by me in 1875,¹ but I neglected to give directions concerning the preparation of asbestos, to make it fit for filtering liquids in chemical analysis. It now appears, however, that such directions would be found useful, and I propose to repair the omission and give the necessary details.

The kind of asbestos to use is a matter of some importance. I have tried three kinds, which are sold by dealers in New York, as the *Canadian*, the *Italian* and the *Australian*. This last is less flexible than the other two, and consequently the fibres do not felt together and pack as closely on the perforated plate. Hence liquids filter more rapidly, and the Australian is, on this account, preferable to the two other kinds. I am informed that the Canadian asbestos is the most soluble in acids, but I have not verified the assertion.

Whatever may be the kind of asbestos used, the following is a process for obtaining, with little trouble, a quantity of the pulp in a fit state for filtration:

A coarse brass sieve is placed over a sheet of paper, and a handful

¹ See "American Chemist," v, p. 44. "Chemical News," xxxii, p. 46.

of asbestos is rubbed pretty roughly over the sieve cloth. This breaks it up in such a way that the smaller fragments pass through the meshes, and are deposited on the paper underneath. After awhile the portion which remains on the sieve cloth is collected in one bundle, and rubbed again in the same manner, and the operation is repeated until a sufficient quantity has gone through. In a few minutes enough of the material is obtained to last for months.

As to the coarseness of mesh to use, I may say that I have used No. 10 sieve (ten openings to the inch) with satisfactory results. The sieve is best placed bottom up, so as to leave plenty of room under the cloth.

The next operation is to free the sifted material from dust and from the finest particles. This is easily accomplished by placing the asbestos, as obtained above, over another sieve of finer mesh (about No. 25 or No. 30), and stirring it while water is poured over the sieve. The first water which passes through is quite milky, but it gradually becomes clearer as the washing is continued. The washed asbestos is then put in a beaker glass, and boiled for about half an hour with strong hydrochloric acid (about 1 part of fuming HCl to 4 parts of water).

The pulp, after this treatment, is poured over a perforated platinum plate, placed in a funnel,¹ and washed with distilled water until no acidity is shown by litmus paper. The pulp is then taken out of the funnel and strongly heated in a platinum dish. After letting it cool sufficiently it may be placed in a wide-mouth bottle for future use.—*Jour. Amer. Chem. Soc.*, Nov., 1882.

On the Precipitation of the Alums by Sodid Carbonate.
By Edmund J. Wills, D.Sc., F.R.S., and K. L. Barr.—By a series of experiments the authors find that the precipitation of an alum by sodid carbonate takes place in three stages. First, much carbonate is added without any precipitation taking place; secondly, there is a precipitation according to a continuous law until about half the alum is thrown down; and thirdly, the precipitation proceeds according to the previous law, but with altered constants.—*Jour. Amer. Chem. Soc.*, Nov., 1882.

¹A perforated platinum disc, having a stout platinum wire soldered with gold in the centre of the disc, can be used in an ordinary conical funnel. The wire finds its place in the stem of the funnel, and keeps the perforated plate in position. (See "Chemical News," xlv, p. 8). A Gooch crucible of sufficient size may also be used for the same purpose.

DETERMINATION OF BORACIC ACID.

BY EDGAR F. SMITH.

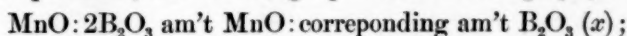
When a solution of manganese sulphate is added to one of borax, and to this mixture an equal volume of alcohol, there separates rapidly a white flocculent precipitate of manganese borate, MnB_4O_7 , insoluble in the alcoholic liquid. The excess of manganese sulphate remains in solution, and can readily be determined in the filtrate from the borate after the expulsion of the alcohol. To ascertain whether the above might be available quantitatively, the following solutions of definite strength were prepared and the experiments recorded.

1. A solution of manganese sulphate, made by dissolving 3 grams of anhydrous MnSO_4 in 250 cc. H_2O . 10 cc. of this solution would then correspond to .0600 gram MnSO_4 .

2. Potassium permanganate solution of such strength that 18.5 cc. were equivalent to 10 cc. of I or 1 cc. $\text{KMnO}_4 = .00324$ gram MnSO_4 .

3. Borax solution: 10 grams well-crystallized borax dissolved in 1 liter of H_2O .

The manner of conducting each experiment was as follows: To 10 cc. of the borax solution were added 10 cc. MnSO_4 solution and an equal volume of strong alcohol. The whole was well mixed, allowed to stand, carefully covered, for one-half hour, when the manganese borate was filtered rapidly (best with a suction pump) and washed well with alcohol. The filtrate and washings were placed in a platinum or porcelain dish and evaporated to dryness on a water-bath. The residual manganese was then determined according to Volhard's¹ method by dissolving it in water, adding zinc sulphate, then heating to almost boiling, and carefully running in potassium permanganate until the liquid assumed a pink color. The quantity of manganese sulphate thus found and deducted from the whole amount of the salt added, gave a difference representing the manganese sulphate which had combined with the borax. After calculating the amount of manganous oxide to which the sulphate, found by difference, is equivalent, the following equations were employed:



and

¹ "Annalen der Chemie," 198, p 318.

Orig. sub. 10 cc. borax solution: $x :: 100:y$ (per cent. B_2O_3 in 10 cc. of the borax solution).

Experiments.

Number of Anal.	Borax solution used.	MnSO ₄ solution added.	No. cc. KMnO ₄ requ'd for excess of MnSO ₄ .	MnSO ₄ in excess.	MnSO ₄ in combination with B ₂ O ₃ .	Per cent. found of B ₂ O ₃ .
1	10 cc.	10 cc.	6.4 cc.	.0207 gram.	.0393 gram.	36.44
2	"	"	6.1	.0198	.0402	37.27
3	"	"	6.3	.0204	.0396	36.71
4	"	"	6.3	.0204	.0396	36.71
5	"	"	6.5	.0210	.0390	36.16
6	"	"	6.4	.0207	.0393	36.44
7	"	"	6.5	.0210	.0390	36.16
8	"	"	6.4	.0207	.0393	36.44
9	"	"	6.2	.0201	.0399	36.99
10	"	"	6.3	.0204	.0396	36.71
11	"	"	6.3	.0204	.0396	36.71
12	"	"	6.4	.0207	.0393	36.44
13	"	"	6.5	.0210	.0390	36.16
14	"	"	6.3	.0204	.0396	36.71
15	"	"	6.4	.0207	.0393	36.44
16	"	"	6.3	.0204	.0396	36.71
17	"	"	6.5	.0210	.0390	36.16
18	"	"	6.4	.0207	.0393	36.44

The calculated percentage of B_2O_3 in borax is 36.60, and from the experimental results it will be observed that the method can be successfully applied in the analysis of soluble borates.

In estimating the boracic acid in insoluble borates, as tourmaline, the following course was pursued. The finely pulverized substance was fused with a weighed quantity of pure sodium carbonate, the fused mass exhausted with water, and to the filtrate containing all the sodium borate, together with some sodium silicate and aluminate, was added an amount of pure ammonium sulphate molecularly equivalent to the sodium carbonate. The solution was then digested until all the ammonia was expelled and the volume of the liquid largely reduced. Any silicic acid or aluminum hydrate which had separated was now filtered off, and the precipitate thoroughly washed with hot water. The solution, again reduced in volume and containing only the borate and sulphate of sodium and excess of ammonium sulphate, was mixed with a definite amount of a manganese sulphate solution (strength previously determined), alcohol added, and after standing one-half hour the borate was removed by filtration, the filtrate evaporated to dryness and the residue carefully ignited to expel the ammonium salt.

The manganese sulphate left was dissolved in water, and the same procedure as indicated in the preceding experiments was carried out.

In a specimen of tourmaline from New York the boracic acid found by this method was 9.70 per cent. Another portion of the same material with Marignac's method¹ yielded 10 per cent. B_2O_3 . In another tourmaline (locality unknown) two determinations by this method gave 6.55 per cent. B_2O_3 and 6.32 per cent. B_2O_3 , while with Marignac's method the amount obtained was 6.80 per cent. B_2O_3 .

In some instances upon evaporating the alcoholic solution preparatory to determining the excess of manganese sulphate, brownish flocks separated. These were always dissolved in a little sulphuric acid and then evaporated to dryness.

The writer is under many obligations to Messrs. N. Wiley Thomas, S.B., and W. H. Jardin, S.B., for their assistance in the execution of the details of the above method.—*Am. Chem. Jour.*, Oct., 1882.

FERROUS CITRATE AND ITS DOUBLE AND SECONDARY SALTS.

BY R. ROTHER.

When two or more dissimilar elementary molecules unite the force which holds each individual molecule together is redirected and distributed in a coincident aggregate whereby the compound molecule is maintained. When the utmost power of all the molecules is exerted the proportional energy of each is termed the atomicity, quantivalence or simply valence of the particular element implied. Since all forces, being modes of motion, are interconvertible there must be stages during the conversion when the prior and post-prior states are no longer of a kind. Neither is the post-prior mode like the new condition of which it is the immediate antecedent. These peculiar and highly interesting phases may be termed transition forces. They are the dynamic analogues of the states of aggregation that intervene between the solid, liquid, gaseous and ultra-gaseous conditions of matter. When chemism begins to merge into mere cohesion the bonds of atomicity suffer a further and continuous subdivision no longer definitely characterized in terms of quantivalence. This transitory state may therefore be properly distinguished as ultra-valence. It becomes evident in such

¹ "Zeitschrift für analyt. Chemie," 1, 405.

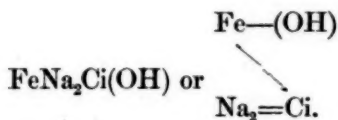
cases where compound molecules of saturated valence still continue to combine and where elementary molecules coalesce with seemingly abnormal capacities. In the opposite direction we also find that many elements most usually do not exert their full atomic power. Such instances are termed apparent valence. This important condition is most thoroughly representative of chemism at its climax. Apparent valence generally gives rise to compounds of the greatest stability owing to the fact that the intra-molecular affinities have been subjected to fewer subdivisions than in the states of higher atomicity. In chemical notation some difficulty is experienced in expressing the formulas of compounds containing the same element in different degrees of valence. Although the atomicity is most usually noted by indices, a much more striking and definite notation would be acceptable. To illustrate a change in that direction the ferrous condition might be indicated by Fo, the ferric by Fi, and the ferrate by Fa. Other elements of varying atomicity could be similarly treated. In course of time ultra-valence will probably command commensurate notice. The chemical notation used in pharmacy is often conveniently abbreviated, especially to avoid writing out in full the complicated formulas of the acids of carbon. But the system employed is not only confusing, but erroneous. The abbreviation for citric acid, for instance, was written Ci, and in its combinations it still appeared as Ci. Now the proper and consistent plan is to designate the radicles only in shortened forms, and hence citric acid may be written H_3Ci .

On a former occasion when treating of ferro-ferric or ferroic citrate the writer obtained the formula for ferrous citrate from a faulty source, stating it to be a triferrous salt, thus, Fe_32Ci . When recently operating on definite quantities of material the writer, however, found that it is a diferrous citrate, thus, $Fe_2H_2Ci_2$ or $FeHCi$, that is, in fact, a double citrate of iron and hydrogen, or properly, a hydroferrous citrate. Correctly speaking, a double, triple, etc., salt is invariably derived from a single acid by substitution of the basic hydrogen by one or more basic radicles partially, or by more than one basic radicle wholly. But when the conditions are reversed, that is, when one basic radicle unites with more than one acid radicle secondary, tertiary, etc., salts are formed. Yet further, when a multiplicity of both acid and basic radicles converge to form a compound molecule then secondary double salts, tertiary triple salts, etc., are produced.

Ferrous citrate, when prepared by boiling citric acid with metallic

iron, is a dingy white and sparingly soluble salt. Prepared, however, by acting on ferrous hydrate or carbonate with citric acid it dissolves rapidly in the generated ferric citrate formed by atmospheric oxidation and produces one of the numerous ferroic citrates. Owing to this peculiarity ferrous citrate was credited with such solubility as to be even deliquescent.

One equivalent of ferrous citrate treated with one equivalent of hydrosodic carbonate yields a very soluble apple-green amorphous double salt, the sodio-ferrous citrate FeNaCi , which is readily obtained in elegant scales. But when one equivalent of ferrous citrate is acted on by two equivalents of the carbonate a very soluble grass-green amorphous secondary double salt is formed, the sodio-ferrous hydro-citrate.



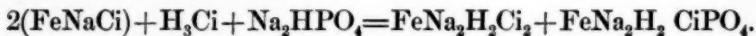
Ferrous citrate heated with even four equivalents of sodic phosphate is not entirely dissolved, but the solution is deeply green, and on cooling yields a large crop of spiny crystals of sodic phosphate. Addition of citric acid to the heated mixture immediately separates a copious transparent green gelatinous precipitate, which requires a very large proportion of sodium citrate for solution. It is therefore evident that ferrous citrate cannot be successfully treated with sodic phosphate alone.

If two equivalents of sodio-ferrous hydrocitrate are mixed with two equivalents of sodic phosphate an abundant precipitate of ferrous phosphate, together with a deep green solution, results. An equivalent of citric acid now added dissolves the precipitate completely, or, if incorporated previous to the sodic phosphate, prevents the precipitation.

The admixture of one equivalent of sodic phosphate to two equivalents of sodio-ferrous citrate also occasions a precipitate of ferrous phosphate, redissolved by an equivalent of citric acid, or prevented when this is previously added.

Both of the above cases, therefore, show that half as much more citric acid as these double salts already contain counteracts the formation of precipitates insoluble in the presence of sodic phosphate. The resulting splendidly emerald-green solution contains two very remark-

able amorphous salts, the one a double citrate of sodium and iron, the other a citro-phosphate of these metals. Their generation is represented by the following equation :



The hydro-sodioferrous citrate and citrophosphate may also be written thus :



This saline mixture admits of scaling, but not so readily and elegantly as the sodioferrous citrate above described.

The object in preparing these compounds was to employ them in the various phosphatized and citrated mixtures where permanency of solution is a desideratum. Hence their behavior towards phosphoric acid is interesting.

Phosphoric acid, when added to any of these salts in moderate proportion, discharges their color to a great extent, but wholly when added in sufficient excess. The acidulated solution is apparently permanent; however, with a certain inferior proportion of acid, a slight precipitate of ferrous phosphate appears; but the sodioferrous citrate comports itself, in a particularly special manner, distinct from all the rest of these compounds. A sufficient excess of phosphoric acid added at once to this salt produces a clear, permanent and perfectly colorless solution; yet, when phosphoric acid is added in such amount as to leave the solution lightly green, a profuse cream-colored granular precipitate of the noteworthy triferrous phosphate, $\text{Fe}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$, is produced. This precipitate, when once formed, requires a much larger proportion of phosphoric acid for solution, and also considerable time. Chlorhydric acid dissolves it more freely, yet slowly. Nitric acid attacks it with difficulty after much time. Normal monad citrates are also indifferently active. The reason for its formation under such peculiar conditions is that the salt which yields it contains no hydrogen.

Ferrous citrate is best prepared by heating for about three hours, or until reaction ceases, 56 parts of very fine iron filings with 210 parts of citric acid and a nearly constant 1,500 parts of water. As the iron always contains carbon, the quantity will practically have to be about

60 parts. Since the citrate only serves to prepare the soluble forms, any amount of iron in excess is immaterial.

The sodioferrous citrate is prepared by adding to the ferrous citrate of the above process 84 parts of hydrosodic carbonate, heating until effervescence ceases, setting the solution aside till the carbonaceous residue has subsided, decanting the clear liquid, evaporating it to a syrupy consistence, and spreading it on glass or porcelain plates to dry. A definite solution can also be kept on hand.

The sodioferrous citrophosphate is prepared by adding 105 parts of citric acid and 179 parts of sodic phosphate to the product of the preceding process, and proceeding in a similar manner as there directed.

The ferroic citrate above mentioned is a very useful compound, and could, perhaps, in many instances, supplant the ferric citrate. Nevertheless, a complete conversion of the ferrous into ferric citrate would be very desirable. At one time the writer deemed it impossible to convert the ferrous citrate by means of nitric acid, but recent quite successful trials show that it can be done. If 45 parts of nitric acid is added to the ferrous citrate above obtained, and carefully heated to dryness, perfect transformation is effected.

DETERMINATION OF ORGANIC MATTER IN POTABLE WATER.

BY J. W. MALLET.

This investigation was instituted at the instance of the American Government, and is here given in abstract: the full report has not yet been published. The object was to examine the chief processes employed for estimating the organic matter, to test the absolute and relative accuracy of the results obtained by these processes, and to ascertain the nature and scope of the practical conclusions which may be secured. The processes employed were the "combustion," "albuminoid ammonia" and the "permanganate," as suggested by Forchhammer, but in the form advocated by Tidy. The waters examined were of various qualities, good and contaminated more or less, and artificially-prepared water containing animal and vegetable matter. Each analysis was made in triplicate, and the first portion of the report gives an account of the amount of concordance observed between the analyses of each sample as obtained by each individual process. In the combustion process there was found an average

departure from the mean of an individual determination for organic carbon 2.89 per cent., for nitrogen 7.09 per cent., but the departure in some cases far exceeds these figures; however, we find that the results of the combustion process are less trustworthy for nitrogen than for carbon. The average departure from the mean in the albuminoid ammonia process was: free ammonia, 2.23 per cent.; albuminoid ammonia, 3.62 per cent. In Tidy's process the average divergence was: for oxygen consumed in one hour, 1.09 per cent.; for oxygen consumed in three hours, 0.56 per cent., showing a greater irregularity during the early stage than later. The permanganate yields, therefore, the most closely concordant results, whilst the combustion process yields the least.

Extent of Agreement of the Results Obtained by the Different Processes with the Quantities of Organic Constituents known to be Actually Present.—The loss of carbon by the combustion process is considerable, and there is a strong tendency to excess of nitrogen. The loss of carbon is supposed to be due to the evaporation of volatile substances such as butyric and valeric acids which have been shown to be present in some contaminated waters; the excess of nitrogen is due to the presence of ammonia compounds given off by the gas flame in the neighborhood of the evaporating liquid; for although carefully covered, yet there is still a slight communication with the outside air by means of the notch in the rim of the water-bath for the passage of the feed-flask neck. Suggestions are made so as to show how this access of ammonia may be prevented by evaporating the water by steam, by evaporating the water in a vacuum, etc. The loss of nitrogen in Wanklyn's process is due to volatilization of the amines during the first distillation, and as these compounds are not indicated by Nessler, they escape detection as "free" or as "albuminoid" ammonia. In order, therefore, to diminish this loss, a separate distillation should be made with alkaline permanganate added at once; also, to avoid the uncertain ending of the collection of ammonia, the distillation should not be stopped until the last measure of distillate contains less than 1 per cent. of the whole ammonia already collected. Several other alterations in the details of the process are also recommended. The analytical figures obtained by Tidy's process show that the putrescent substances are accurately determined, but not so the non-putrescent, as their oxidation by cold permanganate is so slow. On the other hand, by Kubel's method (oxidation at 100°), a loss of volatile matter

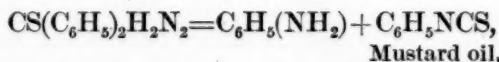
occurs. It is proposed, therefore, to extend the time of oxidation to 12 or 24 hours at a temperature of 20° , examinations of the amount of oxidation being made at intervals of 1, 3, 6 and 9 hours.

Effect on the Results of the Different Processes by Varying the Extent of Dilution of the same Organic Substances in Water.—Under this heading we find that the weaker the solution the greater is the loss of carbon during evaporation, but the greater is the gain in nitrogen; hence, when applying Frankland's ratio C:N to a dilute water, the pollution would appear to be of animal origin; but the stronger the water is, the greater will be the tendency to refer the contamination to a vegetable source. In reference to Wanklyn's process, the weaker the solutions are, the higher are the results obtained for ammonia in both forms. The influence of dilution on Tidy's process is far less marked, but stronger solutions require somewhat less oxygen than is required by calculation. Among the special conclusions drawn concerning Frankland's process we find that the formation of sulphuric acid from the sulphurous acid added during evaporation is of more frequent occurrence than is generally supposed. The combustion process, in its present form, cannot be considered as determining the carbon and nitrogen in water absolutely, as it is but a method of approximation; but in many cases its indications of organic carbon are more valuable than those of the permanganate process, and its results for organic nitrogen more valuable than the indications afforded by the albuminoid ammonia process. The value of Wanklyn's process depends more on watching the rate and progress of evolution of the ammonia than upon the determination of the total amount. The results obtained by Tidy's process are liable to variation with atmospheric temperature at the time of examination, and the amount of oxygen consumed is not a measure of the carbon present. The value of the results depends, as in the ammonia process, more on watching the rate and progress of the oxidation than on the absolute amount of oxygen consumed.

General Remarks on other Chemical Determinations.—The estimation of total solids is liable to great error because of the large effect produced by slight differences in the dryness attained, or by atmospheric deposition on the platinum basin. Waters containing a high percentage of nitrates generally contain but little ammonia. Frankland's view that nitrates are not found in waters deficient in oxygen is in accordance with the results now obtained, with a few exceptions; nitrates are not always formed by reduction.

As the amount of carbon and nitrogen is so excessively small in any ordinary contaminated water, evil effects resulting from the use of such a water cannot be due to chemical compounds, but rather to living organisms present at the same time. The presence of nitrates is not sufficient evidence for the condemnation of a water, but rather that of nitrites, which may be due to a special ferment, which is itself capable of propagating disease. From the presence of chlorides, contamination by animal or vegetable matter must only be determined with great caution. At present, attempts to determine the source of the contamination, whether animal or vegetable, have not been followed by very satisfactory results. Biological experiments show that such waters as are dangerous to animal life have a high C:N ratio. Tidy considers that the putrescent or easily oxidizable substances are of animal origin, whereas those less easily putrescent are vegetable matters. The author does not wholly agree with him, as he finds that the proportionate consumption of oxygen within the first hour is rather greater for those waters containing vegetable than for those containing animal matter, whilst one of the co-workers in this investigation—Smart—considers that the gradual evolution of albuminoid ammonia (Wanklyn's process) indicates organic matter, whether vegetable or animal, in a fresh condition, whereas a rapid evolution indicates putrescent organic matter. Finally, it is not possible to decide absolutely on the wholesomeness of a water by the mere estimation of organic matter. All samples should be examined without delay, as great changes may occur in the composition of the water, but samples should also be kept for 10 or 12 days, and then examined, and their composition compared with that of the fresh sample.—*Jour. Chem. Soc.*, Dec., 1882, from *Chem. News*.

Preparation of Mustard Oils.—A. W. Hofmann states that the mustard oils are best prepared from the disubstituted sulpho-ureas by treating them with a concentrated aqueous solution of phosphoric acid. The sulpho-ureas are easily obtained by treating carbon bisulphide with the amines. Starting with carbon bisulphide and aniline we get diphenyl-sulpho-urea, $\text{CS}(\text{C}_6\text{H}_5)_2\text{H}_2\text{N}_2$; and when this is treated with phosphoric acid it breaks up directly into aniline and phenyl-mustard oil, thus:



Mustard oil.

—*Amer. Chem. Jour.*, Oct.; *Ber. d. Deutsch. Chem. Ges.* [15], 985.

Formation of Alloys by Pressure. W. Spring.—The author propounds the law, that the state of matter is dependent upon the volume it is forced to occupy. Coarsely powdered bismuth, cadmium and tin, mixed in the proportions corresponding to Wood's alloy, were subjected to a pressure of 7,500 atmospheres. This alloy melts at 65°. The block obtained was filed and again subjected to the same pressure. Its properties correspond exactly with those of Wood's alloy. Two other alloys, one known as Rose's and common brass, were treated in a similar manner, and the results obtained gave sufficient strength for the argument of the law set forth.—*Jour. Amer. Chem. Soc.*, Nov., 1882.

On Tungsten Bronzes. J. Phillip.—Elaborate discussion on the preparation and analysis of various bronzes. There are four distinct colors—gold-yellow, reddish-yellow, red and blue. The yellow bronzes are most easily prepared pure, and can be obtained in large crystals. A mixture of 2 molecules of normal sodium tungstate, and 1 molecule of tungstic anhydride is employed (hence a mixture of 2 molecules of Na_2O to 3 molecules of WO_3). The tin is gradually added. The entire mixture is kept in quiet fusion for one or two hours. Red bronzes are obtained when 2 molecules of Na_2O and 5 or 6 molecules of WO_3 are melted with tin. Blue bronzes are obtained when more than 3 molecules of WO_3 to 1 molecule of Na_2O and tin are so treated. Tungsten bronzes are also prepared by reduction of acid sodium tungstates by means of hydrogen.—*Jour. Amer. Chem. Soc.*, Nov., 1882.

Upon the Chemical Composition of the Ripe and Unripe Banana. By L. Ricciardi.—

	Ripe.	Unripe.
Water,	66.78	7.92
Cellulose,	0.17	0.36
Starch,	traces	12.06
Tannic substances,	0.34	6.53
Fatty	0.58	0.21
Inverted sugar,	20.07	0.08
Cane sugar,	4.50	1.34
Proteic substances,	4.92	3.04
Not determined,	1.69	4.42
Ashes,	0.95	1.04

The green banana contains a large amount of starch, about $\frac{1}{3}$ of its weight, which disappears in the ripe fruit. When the fruits are left to ripen on the trees nearly all the sugar formed is cane sugar, whilst

the sugar contained in the fruits taken from the trees in a green state, and allowed to ripen afterwards, is composed of $\frac{4}{5}$ of inverted sugar and $\frac{1}{5}$ of cane sugar. The tannic substances and the organic acids of the green fruits disappear when the bananas are ripe.

The ashes of bananas are very rich in phosphoric acid (23.18 per cent.) and potassium oxide (45.23 per cent.)—*Jour. Amer. Chem Soc.*, Nov., 1882.

VARIETIES.

ADMINISTRATION OF TANNIN.—Dr. H. Ribbert, of Bonn, contends that the amount of albumen excreted in albuminuria is reduced by tannin, preferably given in alkaline liquids, and the efforts will be crowned the more with success the earlier in the disease the administration of tannin is commenced. Dr. Lewin, from his experiments made to prevent the disagreeable effects of tannin on the mucous membrane of the alimentary canal, recommends the following prescriptions:

I. *Sodium tannicum*.—R Solut. acidi tannici, gr.xvi-xxx: f $\bar{3}$ v. Adde solut. sodii bicarb. q. s. ad react. alkalin.

Sig.—To be kept in a well-corked glass, and used within one or two days.

II. *Tanninum albuminatum*.—R Solut. acidi tannici, $\bar{3}$ ss: f $\bar{3}$ iii. Adde, agitando, solut. albumin. ovi unius, f $\bar{3}$ iii.

The greater the quantity of the tannic acid, the greater must be, in proportion, the amount of the white of the egg.

III. *Tannin. albuminat. alkal.*—R Acid. tannic., $\bar{3}$ ss-gr.lxxv. Aquæ destillat., f $\bar{3}$ iii. Adde, agitando, albumin. ovi unius, sodii bicarb. solut. q. s. ad solut. limpid.

Best adapted for a longer course of tannic acid.

Sugar in any form should be avoided in these preparations.—*Med. and Surg. Rep.*, 1882, Aug. 5.

JUGLANS CINEREA IN ABORTION.—Dr. W. L. Bell, Morrelton, Arkansas ("Medical Brief," May, 1882), reports several cases in which butternut, given in the form of a compound syrup, has been of marked value in the prevention of abortion. The formula used by him is as follows: R Fluid extract of hyoscyamus $\bar{3}$ i, fluid extract of juglans cinerea $\bar{3}$ i, oil of sassafras $\bar{3}$ ss, sodium bicarbonate $\bar{3}$ ss, simple syrup $\bar{5}$ vi. M. This mixture should be given in teaspoonful doses three times a day from the time of the threatened abortion till the completion of gestation. Juglans cinerea was at one time used in the treatment of scrofula, and as a wash for leucorrhœa.—*Chicago Med. Review*, June 1.

DELPHINIUM AJACIS.—From his experiments with the acetic and aqueous infusion, Dr. Benvenuti draws the following conclusions: The flowers

of the delphinium possess an insecticide action. They are to be preferred to other remedies of similar action on account of cheapness and absence of smell. They have a marked anesthetic action, are excitant, rubefacient, astringent, and antizymotic. The author thinks this remedy has many points of resemblance to carbolic acid and iodoform.—*Giorn. Ital. delle mal. Ven. e della Pelle; Louisv. Med. News.*

PROPER WAY TO GIVE ACONITE.—In the "London Medical Record" Dr. William Murrell makes some judicious observations on the correct plan for administering aconite so as to secure its most advantageous action. He observes that aconite does act best in small doses frequently repeated. Many practitioners get no good from aconite because they do not know how to use it. The dose of the tincture recommended in the British Pharmacopœia—from five to fifteen minims—is absurdly large, and no one with any regard for his patient's safety or his own reputation would ever think of giving it. The best way is to put half a drachm of the tincture in a four-ounce bottle of water, and to tell the patient to take a teaspoonful of this every ten minutes for the first hour, and after this hourly for some hours. Even smaller doses may be given in the case of children. The great indication for the use of aconite is elevation of temperature; the clinical thermometer and aconite bottle should go hand in hand. If properly used, aconite is one of the most valuable and indispensable drugs in the pharmacopœia.—*Louisville Medical Review*, Dec. 16, 1882.

PROPYLAMINE IN CHOREA.—Every few months some new drug is brought forward as a cure for chorea. Dr. J. H. Carstens, in the "Detroit Clinic," claims good results from propylamine given in teaspoonful doses of a mixture of one dram of propylamine to the ounce. Several cases of rapid cure are mentioned, cases which had resisted other forms of treatment. Dr. Carstens does not claim that his treatment is new at all, but simply calls attention to his success with the above drug.—*Chicago Medical Review*, vi 534.

IODIDE OF POTASSIUM IN FRONTAL HEADACHE.—Dr. Haley, Australian "Medical Journal," claims that minimum doses of iodide of potassium are of great service in frontal headache. A two-grain dose dissolved in half a wineglass of water will often cure a dull headache which is situated over the eyebrow. The action of the drug is quite rapid.—*Chicago Med. Review*, vi, p. 530.

BICHRIMATE OF POTASSIUM IN SYPHILIS.—The "Journal of Cutaneous and Venereal Diseases," Nov., 1882, calls attention to the recent monograph by Dr. J. Edmund Guentz, on the treatment of syphilis without mercury. The bichromate was recommended many years ago in this disease, but it must be given in very minute doses, as it readily induces vom-

iting, cardialgia, acute gastric catarrh, and even gastritis. Such doses are so slow in their operation that the medicine is without real value when a prompt removal of syphilitic symptoms is demanded, or when it is absolutely necessary to attack the disease energetically with a view to its speedy eradication. When the contrary indication prevails, the above remedy would seem of the highest value. A list of over one thousand cases of specific disease is given in which no mercury was found necessary in the treatment.—*Chicago Med. Review*, vi, p. 531.

MINUTES OF THE COLLEGE.

PHILADELPHIA, December 25, 1882.

At a meeting of the Philadelphia College of Pharmacy, held this day at the College hall, the following members were present, viz.: Dillwyn Parrish, President; Thoms S. Wiegand and Wm. J. Jenks. There not being a quorum in attendance, the President declared the meeting adjourned until Tuesday, December 26, 1882, at 3.30 P.M.

PHILADELPHIA, December 26, 1882.

An adjourned meeting of the Philadelphia College of Pharmacy was held at the College hall, No. 145 North Tenth street, Dillwyn Parrish, President, in the chair. Eleven members present.

The minutes of the last meeting were read, and, on motion, adopted.

The minutes of the Board of Trustees since September last were also read by Wm. C. Bakes, Secretary of the Board, and, on motion, approved.

Charles Bullock, Chairman of the Committee, appointed at the last meeting to revise the list of Honorary and Corresponding Members, reported progress. The committee was continued.

There being no further business, then, on motion, adjourned.

WILLIAM J. JENKS, *Secretary*.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, Dec. 19, 1882.

In the absence of the President Mr. W. J. Jenks was called to the chair. The minutes of the last pharmaceutical meeting were read and approved.

Dr. Miller introduced Dr. Carl Seiler, of the University of Pennsylvania, who gave a very instructive lecture upon nose and mouth breathing, showing how important the subject is to those who, like the apothecary, are confined within doors so much of their time. He stated that the air which is breathed through the nostrils is two or two and a half degrees warmer than that inhaled through the mouth; that it is filtered by the hairs which are

in the nostrils, and that the mucous secretions of the latter also remove many impurities from the air, and consequently a purer air reaches the lungs when thus inhaled. The reasons why so many breathe through the mouth is that they suffer from hypertrophies of the nasal fossa or have polypi, which greatly contract the air passages of the nostrils; these must be removed to give relief. Dr. Seiler illustrated his remarks by diagrams, which made the subject much more interesting and instructive.

On motion of Dr. Miller, the thanks of the meeting were returned to Dr. Seiler for his remarks, and he was requested to repeat the address, when we would endeavor to secure a larger attendance.

Mr. Franciscus promised to bring an instrument designed to facilitate the coating of pills with gelatin, suited to the needs of the apothecary.

Dr. Miller stated that Dr. Brouen, who was very much engaged at present, signified his willingness to give a lecture upon the etiology of phthisis in the month of April, and suggested that he be invited to deliver it.

There being no further business, the meeting adjourned.

T. S. WIEGAND, *Registrar.*

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

THE ALUMNI ASSOCIATION OF THE PHILADELPHIA COLLEGE OF PHARMACY held its third social meeting Tuesday, December 12th, when John E. Cook, Ph.G., delivered a lecture on "*Weights and Measures*," explaining the manner in which the units of measurement are obtained, and the importance of measuring accurately; he gave a sketch of the history of the adoption of the English yard measure and of various systems of notation, with particular reference to the decimal system.

Prof. S. L. Adams, teacher of elocution, entertained the meeting with several humorous recitations, after which a discussion on the new pharmacopœia took place, participated in by Messrs. Sayre, Miller, McIntyre, Blair, and others.

On the evening of December 28th, a microscopical exhibition had been arranged under the general supervision of A. P. Brown, Ph.G. The microscopes of the Alumni Association and of the College, as well as a number of instruments from several makers in Philadelphia, were upon the table and well supplied with interesting specimens. Subsequently, the party was entertained with an attractive exhibition by means of the oxyhydrogen lantern arranged by Prof. Sadtler.

THE PHARMACEUTICAL SOCIETY OF NEW SOUTH WALES held its annual meeting in Sydney, June 14, 1882. The Society is in a prosperous condition; the finances are well managed; the membership during the preceding year had increased 34; the library was considerably augmented by donations and purchase, and a course of lectures given under the auspices of the Society met with unqualified success. The efforts for the

enactment of a Pharmacy law have thus far been unsuccessful, but will be renewed. The president is Mr. F. Senior, and the secretary, Mr. W. T. Pinhey.

PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.—At the evening meeting, held December 6th, the president, M. Carteighe in the chair, a paper by W. A. Shenstone on the crystalline constituent of Jafferabad aloes was read, showing that this aloin is identical with the principles of Zanzibar and Socotrine aloes. The paper will be published in our next number.

A very interesting paper on *spurious and adulterated drugs* was read by Mr. E. M. Holmes. Accidental admixtures may take place through ignorance or carelessness in collecting, drying, or handling of drugs. Unknown drugs are occasionally sent into the market from foreign countries, and when proving unsalable on account of being unknown, are, in London, put up to auction under the names of those drugs which they most nearly resemble. Spurious drugs are often purchased at a low price by continental dealers known as "mixers," and after being mixed with genuine drugs are sent back with the view of underselling dealers in the legitimate article. The term "adulterated drugs" may be limited to those in which there is evidence of an intent to defraud—

1. By the addition of any substance of less value to increase the weight, such as the addition of sulphate of barium to cochineal and saffron.

2. By the admixture of cheaper drugs having a great similarity of appearance, *e. g.*, marshmallow with belladonna root; arnica with the flowers of *Inula britannica* ("American Journal of Pharmacy," 1882, p. 458). A year or two ago white *ipecacuanha*, *Ionidium Ipecacuanha* was offered in the London market and has apparently found its way to France, where it has been used for the purpose of adulterating senega, as reported in the November number of the "Répertoire de Pharmacie."

3. By the addition of a coloring matter to enhance the value, *e. g.*, aniline dyes to rose leaves, as reported by Mr. T. E. Greenish in 1881.

4. By the exhaustion of their active principles before being offered for sale as the genuine article, such as jalap, deprived of resin. *Ipecacuanha* of a darker appearance and cleaner surface than is observed in the ordinary drug, has been noticed by Mr. Holmes; it had been mouldy, was washed and dried and seemed to contain little emetine.

Mr. Holmes also called attention to the facts that when an adulterated drug is made known in one country it soon appears in another, and that the publication of cases of adulteration of drugs is not sufficient to act as a deterrent; this was shown to be the case with saffron, which, in 1869, was observed in France to be adulterated with 12 per cent. of mineral matter, while similar adulterations, occasionally amounting to 40 per cent., were noticed since 1870 in England and the United States, 1874 in Germany, and 1879 in Russia.

A lengthy discussion followed the reading of this paper, in which it was shown that through such exposures and in consequence of proper education, adulterations had become less frequent than formerly.

A paper by W. A. H. Naylor and J. O. Braithwaite was read, in which

they demonstrated by a number of experiments, that oxalic acid *alone* exercises no reducing action either on *arsenic acid* or on *disodic arseniate*, and that the oxalic acid cannot be credited indirectly with the reduction which results from the transmission of sulphuretted hydrogen through the solution of arseniate and oxalate previously boiled and acidified with sulphuric acid.

EDITORIAL DEPARTMENT.

CHANGES OF STRENGTH IN THE NEW PHARMACOPŒIA.—The numerous changes in the new Pharmacopœia will doubtless, in the beginning, occasion a certain amount of inconvenience, and, as a necessary consequence, many comments, which we invite our readers to contribute to the pages of the "Journal," as their experience with the working processes may provoke. For the present we desire to briefly direct attention to the table on pp. 454 and 455 of the Pharmacopœia. It will be observed that in the majority of preparations enumerated there the changes in strength are of comparatively slight importance.

But we desire to call special attention to the following preparations, which are considerably *weaker* than in the Pharmacopœia of 1870: acetum opii has been reduced in the amount of the active drug over 36 per cent., vinum opii 23 per cent., tinctura aconiti (radicis) 16 per cent.; tinctura nucis vomicæ 43 per cent., tinctura stramonii 33 per cent., tinctura cannabis about 44 per cent., tinctura veratri viridis 9 per cent. Considering, however, the change adopted in the morphine strength of opium, which, for the powder is now *between 12 and 16 per cent.*, while heretofore it was *not less than 10 per cent.*, it is evident that the vinegar of opium, if made from the highest grade of opium now recognized, would be of the same strength as the same preparation of the preceding pharmacopœia made with the lowest grade opium then recognized; and under the same conditions the wine of opium would become 23 per cent. stronger than heretofore. In point of fact, however, we believe that the two opium preparations named will really be weaker now, as indicated above, since in by far the largest number of cases they were heretofore made with commercial opium without regard to its higher morphia strength.

A similar observation in the opposite direction must be made in regard to tinctura opii and tinctura opii deodorata, which have been *increased* in opium strength from about 8.5 to 10, or about 17 per cent., while the difference in amount of morphine in the opium of the two pharmacopœias might increase the strength about 90 per cent. In fact, however, for the reason stated before, the actual increase in strength is about one-sixth.

Of perhaps more consequence are the changes of the drug in several galenical preparations, having the same name in the old and new Pharmacopœia. *Extractum aconiti* was formerly made of the leaves, now it is directed to be made of the root, a change which appears to us to be so radical and serious that physicians desiring the latter should plainly indicate

it upon their prescriptions by adding to the pharmacopœial name either the designation "radicis," or "Phar. 1880." The very slight activity or inertness of conium herb has been repeatedly demonstrated. Extract and tincture of conium were formerly made of the leaves, now they are directed to be prepared from the green fruit, a change which would seem to call for similar precautions as in the case of extract of aconite.

Although, in a number of other preparations, changes have been made either increasing or decreasing their strength, yet the danger of possible serious results does not appear to be so imminent as in the cases cited above.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Die Chinarinden in pharmakognostischer Hinsicht dargestellt. Von F. A. Flückiger. Mit viii lithographirten Tafeln. Berlin, 1883: R. Gaertner. 8vo, pp. 79. Price, 9 marks.

The Cinchona barks, pharmacognostically considered. With 8 lithographic plates.

This monograph is based upon the article Cinchona contained in the author's well-known and highly-appreciated "Pharmakognosie," the second edition of which is now in course of publication, enlarged and completed in various directions. A very valuable treatise is here offered on one of the most important remedial agents, which, however, is of still greater importance as the source of quinine and allied alkaloids. The successful cultivation of cinchonas in various parts of the world, the extensive manufacture of the alkaloids, the persevering researches into their chemical relations with the view of their analytical determination and synthetical production, the discovery of quinine in a bark distinctly different from the cinchonas—all these facts have contributed towards intensifying the interest into this indispensable drug. The work before us does ample justice to the subject in its various relations. It is written in the clear and attractive manner which characterizes the author's writings, and while it avoids the tedious details, leaves no point of interest, be it general or special, without receiving its due share of attention. After considering in a general way the origin of the bark, the important species of Cinchona are characterized; also the two species of Remijia which during the last few years furnished the cuprea bark of commerce. The chapters on the habitat and culture of the cinchonas, the collection of their barks according to the various methods in use in South America and India, the physical properties and anatomical structure of the barks, the contents of their tissues, and on the commercial sorts of cinchona barks, are followed by a brief consideration of the so-called false cinchona barks and an extended description of cuprea bark. Then follow commercial statistics from the various countries producing these barks, the characteristics and relative quantities of the chemical constituents, the quantitative determination of the alkaloids and their manufacture. Finally, the history of the cinchona barks is fully considered in its

various interesting phases, and a list is appended of the most important works on the cinchonæ and cinchona barks published during the past sixty years. The artistically executed plates contain illustrations of branches with flowers and fruit of *Cinchona succirubra*, *C. lancifolia*, *C. officinalis* and *Remijia pedunculata*; of branches, flowers, fruits and seeds of *C. Calisaya* var. *Ledgeriana*; of fruit of *Cascarilla heterocarpa*, and of microscopic sections of young and old *Calisaya* bark, of the bark of *Cinchona lancifolia* and of *cuprea* bark.

We sincerely hope that the author may be induced to issue this interesting and important little work also in English, so that those who are not conversant with the German idiom may consult its instructive pages.

Flora Peoriana. Die Vegetation im Clima von Mittel-Illinois. Von Friedrich Brendel. Editio separata a "Természetráji Füzetek," vol. v. a musæo nationali hungarico edito. Budapest: 1882. 4to, pp. 107.

The author states in the preface that the contents of this pamphlet are the results of long-continued observations made upon a small spot of our globe, and that they are intended to be merely a contribution to botanical geography, made with the hope that the botanists of other places might collect similar material in larger quantity and better quality, for the purpose of furthering that science according to a uniform plan. To which we add that similar monographs—considering the topography, climatic and other conditions influencing the distribution of plants in certain localities—are still wanting in most of our States. The treatise before us possesses great merit, due to the evidence of careful and intelligent observation and of judicious use of the literature relating to the subjects under consideration. It deserves the attention of botanists generally and of North American botanists in particular, even though they should not agree with all deductions.

Pharmaceutische Rundschau und Zeitung für die wissenschaftlichen und gewerblichen Interessen der Pharmacie und verwandten Berufs- und Geschäftszweige in den Vereinigten Staaten. Herausgegeben von Dr. Fr. Hoffmann, 64 Ann st., New York. Price, \$2 per year. (Universal Postal Union, \$2.50.)

Pharmaceutical Review and Gazette for the scientific and business interests of Pharmacy and allied vocations and trades in the United States.

The first number of this new pharmaceutical journal is before us; it forms 'a handsome quarto pamphlet of 28 pages, and by its contents gives evidence of the labor and care bestowed upon it and of its high aims and objects. A number of original contributions and of ably written editorials favorably introduce the new journal, and a careful selection and systematic arrangement of the results of the more valuable papers, published at home and abroad, testify to its claim expressed in the title of being a pharmaceutical review in fact as well as in name. The large number of educated pharmacists in North America, thoroughly familiar with the German language, will doubtless aid the enterprise which, under the guide of its favorably known editor, will lend its influence towards the sound and thorough progress of pharmacy.

Propriétés optiques des liquides et leur application à l'analyse Par Théodore Malosse, pharmacien supérieure, etc. Montpellier, 1882. 8vo, pp. 159.

Optical properties of liquids, and their application in analysis.

A thorough treatise on the above subject, which is considered first in its general relations and more particularly in regard to refraction, absorption, fluorescence, and rotating power under various conditions. The second part contains the practical application of the optical laws to analysis, both qualitative and quantitative, and gives a number of practical examples.

Recueil de quelques mémoires publiés pendant l'année 1882 dans le Comos les Mondes. Par le Dr. Donato Tommasi. 8vo., pp. 18.

A republication in pamphlet form of several essays on physical and chemical subjects.

Annual Report of the Surgeon-General, United States Army. 1882. Pp. 18

The report gives a full exposition of the general transactions of the medical department of the army for the fiscal year ending June 30, 1882. The library, devoted entirely to medicine and its branches, now contains 57,000 volumes and 63,700 pamphlets, and forms a most valuable source of information which is used by investigators residing in all parts of the country. A considerable increase is also reported in the number of specimens contained in the Army Medical Museum, aggregating over 22,500 in the different sections. The value of the library and museum is such that these collections fully deserve to be protected against the possibility of being destroyed, and the erection of a suitable fire-proof building for their accommodation is, therefore, urged upon Congress.

The following pamphlets and reprints have been received :

Statement of the present condition of bankruptcy legislation in Great Britain, France, and the United States. Prepared for the information of the Chamber of Commerce of the State of New York by D. C. Robbins. Pp.40.

Conjoint Session of North Carolina Board of Health and Medical Society of North Carolina, held in Concord, May 10, 1882. Raleigh. Pp. 66.

On the Treatment of the Night-sweating of Phthisis with Agaric. By William Murrell, M.D, etc. (From "The Practitioner," Nov., 1882.)

The Oleates and Oleo-palmitates in Skin Diseases.

The Therapeutic Action of Potassium Chlorate. And

The Treatment of Syphilis with Subcutaneous Sublimate Injections. By J. V. Shoemaker, A.M., M.D. (From Transactions of the Pennsylvania and of the American Medical Association.)

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Arnold, Charles Frederick,	Fort Dodge,	Iowa.	A. P. Blomer.
Babb, Grace Lee,	Eastport,	Me.	Jos. P. Remington.
Baggé, Edward Everett,	Cumden,	N. J.	Dr. S. S. Bagré.
Baker, Charles Harry,	Trenton,	N. J.	R. Rickey & Co.
Ballentine, Allen De Bow,	Philada.,	Pa.	G. S. R. Wright.
Balmer, John Henry,	Elizabethtown,	Pa.	John Bley.
Barr, William Henry,	Milwaukee,	Wis.	Drake Bros.
Baumgardner, Charles Benjamin,	Altoona,	Pa.	J. R. Mateer.
Beans, Edwin K., Jr.,	Philada.,	Pa.	Martin Goldsmith.
Bellis, William Henry,	Flemington,	N. J.	J. M. Bellis.
Benjamin, Samuel Newman,	Deckertown,	N. J.	Emmor H. Lee.
Bolton, Stephen Conklin,	Watertown,	N. Y.	Dr. H. H. Deane.
Borose, Henry Augustus,	Norristown,	Pa.	S. P. Wright.
Booth, Fredk. Smith,	Philadelphia,	Pa.	J. F. Trenchard.
Boyd, Evan Garrett,	New Castle,	Delaware.	Dr. C. E. Ferris & Son.
Briggs, Matt Ashley,	Valdosta,	Ga.	R. Thomas & Co.
Brown, Joseph Henry,	Morris,	Ill.	John Brown.
Browning, Robert Craighead,	Indianapolis,	Ind.	Browning & Sloan.
Bruchenhein, Byron Edwin,	Milwaukee,	Wis.	Drake Bros.
Bullock, Wm. Anthony,	Philada.,	Pa.	Bullock & Crenshaw.
Burt, Walter Colton,	Philada.,	Pa.	Bullock & Crenshaw.
Butler, George White,	Bryn Mawr,	Pa.	R. W. Cuthbert.
Campbell, Milton,	Easton,	Md.	J. T. White.
Champion Carleton Cole,	Philada.,	Pa.	Bullock & Crenshaw.
Cheatham, Matt Venable,	Clarksville,	Texas.	J. L. Reed.
Clinch, John Houston McIntosh,	Waynesville,	Geo.	Fred. Brown.
Cline Walter Howard,	Atlantic City,	N. J.	C. C. Vanderbeck.
Cohen, Nathan Alexander,	Philada.,	Pa.	Musson & Housekeeper.
Cole, Edward Nelson,	Toledo,	Ohio.	R. F. Fairthorne.
Coleman, Mimmus William,	Selma,	Ala.	Cawthorn & Coleman.

Matriculants.	Town or County.	State.	Preceptor.
Cook, John William,	Hagerstown,	Md.	Croft & Conlyn.
Cox, Geo. Washington,	Philada.,	Pa.	
Craig, Clark Rankin,	Chambersburg,	Pa.	Harry Fisher.
Cuskaden, Albert Douglass,	Philada.,	Pa.	
Cozens, Nathan Alexis,	Woodbury,	N. J.	J. W. Merritt.
Dalpé, Fred. Augustus,	Reading,	Pa.	John L. Curry.
Daley, John,	Beldjere,	N. J.	Dr. W. A. Burns.
Dare, John Henry,	Bridgeton,	N. J.	J. A. Parker.
Davis, Harry Irvin,	Holidaysburg,	Pa.	G. I. Davis.
Davis, Wm. Henson,	Germantown,	Pa.	Chas. E. Davis.
Deakyné, Harry Harttup,	Smyrna,	Del.	H. C. Blair's Sons.
Dietrich, Howard Dickson,	Harrisburg,	Pa.	George Phillip Scheele.
Duffey, Roger William,	West Chester,	Pa.	M. Shingle.
Dundore, Milton Jacob,	Reading,	Pa.	J. A. Gingrich.
Eilinger, Fred. Rudolph,	Rochester,	N. Y.	George Bille.
England, Joseph Winters,	Philada.,	Pa.	Robert England.
Esenwein, John Riley,	Reading,	Pa.	Augustus Esenwein.
Fasig, Harry Buckley,	Columbia,	Pa.	James A. Meyers.
Fell, Edgar Burnside,	Wilmington,	Del.	Z. James Belt.
Finck, Robert F.,	Philada.,	Pa.	A. R. Finck, M.D.
Flemming, Dan. Wm.,	Philada.,	Pa.	S. C. Blair, M.D.
Fleming, Frank Byerly,	Shippensburg,	Pa.	J. C. Altick & Co.
Follmer, Daniel,	Milton,	Pa.	C. C. Hughes.
Franciscus, Wm. Charles,	Lock Haven,	Pa.	W. B. Wilson.
Frankiser, John Fred.,	Loudonville,	Ohio.	D. F. Shull & Co.
Frey, John Peter,	Union City,	Ind.	W. H. Faunce.
Frey, John William,	Philada.,	Pa.	Jas. Huston.
Fries, Charles Joseph Valentine,	Reading,	Pa.	Francis X. Wolf.
Funk, Francis Marion,	Wauseon,	Ohio.	E. H. Kaerccross.
Geiger, George Lambert,	Staunton,	Va.	R. Shoemaker & Co.
Gleim, William Bomgardner,	Lebanon,	Pa.	R. England.
Good, Harvey Jonas Tilghman,	Allentown,	Pa.	W. W. Moorhead, M.D.
Gray, Harry Tilford,	Bloomington,	Ill.	Haering & Rinehart.
Gregg, Henry Hamilton,	New Lisbon,	Ohio.	M. T. Nace.
Guest, Samuel Stratton,	Camden,	N. J.	Bullock & Crenshaw.
Haba, Gustav,	Sheboygan,	Wis.	J. A. Heintzleman.
Hallowell, Charles Wesley,	Philada.,	Pa.	Wm. R. Warner & Co.
Hammell, Walter Gunnell,	Camden,	N. J.	A. W. Wright & Co.
Hannigan, Wm. T.,	Pottstown,	Pa.	C. T. Smith.
Hannan, Owen Burdette,	Greene,	N. Y.	S. E. R. Hassinger.
Harris, Frank Pierce,	Hamburg,	Pa.	Wm. Harris.
Harrison, James Oliver,	St. Michael's,	Md.	Wm. H. Rinker.
Hayhurst, Susan,	Philada.,	Pa.	Woman's Med. College.
Haynes, Thomas Jerdone,	Milford,	Del.	T. F. Hammersley.
Heisler, John Clement,	Mifflinburg,	Pa.	A. H. Bolton, M.D.
Helm, Chas. Frederick Gustav, Jr.	Philada.,	Pa.	Louis C. Bauer, M.D.
Hillan, John Michael,	St. Clair,	Pa.	A. Kennedy.
Horsey, John Marshall,	Charleston,	S. C.	G. J. Luhn.
Jones, Daniel R.,	Milwaukee,	Wis.	John A. Dadd.
Jones, Henry Norford,	Winchester,	Ky.	T. F. Phillips.
Jones, James Miles,	Reading,	Pa.	J. H. Stein.
Johnson, Theodore Milton,	Huntington,	Ind.	H. F. Drover.
Johnston, Thomas Crawford,	Philada.,	Pa.	R. H. Johnston.
Jungkunz, William Frederick,	Freeport,	Ill.	Emmert & Burrell.
Kalmbach, Henry George,	Philada.,	Pa.	E. C. Vogelbach.
Keller, Fred. Rudolph,	Philada.,	Pa.	G. H. Toboldt.
Kempfer, Emil Frank,	Racine,	Wis.	G. W. Wright.
Ker, Heber, Jr.,	Staunton,	Va.	J. Wyeth & Bro.
Kerr, Frank Gault,	Marshall,	Mo.	P. H. Franklin.
Kerr, William D'Olier,	Philada.,	Pa.	Stirling Kerr, Jr.
Kerr, Richard F.,	Philada.,	Pa.	M. G. Kerr, M.D.
Keys, John Cathcart,	Philada.,	Pa.	R. Keys, M.D.
Kindig, Rudolph,	Switzerland,	Pa.	J. T. Hoskinson.
King, William Henri,	Philada.,	Pa.	B. F. Johnson.
Kirk, James Edgar,	Dover,	Del.	T. C. Tomlinson, M.D.
Kline, Horace Thompson,	Philada.,	Pa.	Geo. I. McKelway.
Klingler, John Harrison, Jr.,	Dover,	Del.	H. C. Blair's Sons.
Krier, Jas. Delaplaine,	Chester,	Pa.	J. F. Hayes.
Lacy William Reif,	Reading,	Pa.	W. D. Robinson.
Lehman, Frederick Charles,	Philada.,	Pa.	Fredk. Lehman.
Leonard, Isaac Edward,	White Haven,	Pa.	J. J. Baker, Jr.
Leonhard, Louis Charles,	Dayton,	Ohio.	George Latin.
Light, William Wirt,	Oregon,	Ill.	John Wyeth & Bro.
McNair, Whitmel Horne,	Tarboro,	N. C.	E. V. Zoeller.
McCarthy, Cornelius Joseph,	St. Clair,	Pa.	Bullock & Crenshaw.
McCausland, James Ralston,	Philada.,	Pa.	L. E. Sa re.
McCreight, Robert,	Philada.,	Pa.	R. McNeil.
Madden, Ferd. Sharp,	Philada.,	Pa.	R. Simpson, M.D.

Matriculants.	Town or County.	State.	Preceptor.
Maddock, Wm. Worrell,	Atlantic City,	N. J.	H. C. Blair's Sons.
Malatesta, Joseph Mark,	Philada.,	Pa.	J. H. Blake.
Marshall, Thomas Chew,	Pittsburg,	Pa.	M. M. Schneider.
Matthews Wm. Leaming,	Philada.,	Pa.	
Merrick, Jr., Edwin Augustus,	Philada.,	Pa.	W. H. Pile & Son.
Michel, Bernard,	Dubuque,	Iowa.	Junkerman & Haas.
Mickley, Ewald Gustav Ferd.,	Davenport,	Iowa,	F. J. Koch.
Miller, Harold Baughman,	Carlisle,	Pa.	H. C. Blair's Sons.
Miller, Turner Ashby,	Danville,	Va.	Dr. H. W. Cole.
Millikin, Thomas Newman,	Wilmington,	Del.	J. M. Harvey.
Moerk, Frank Xavier,	Philada.,	Pa.	August Kuhlmann.
Moffett, Jr., James,	Philada.,	Pa.	David Moffett.
Moll, Horace,	Barro,	Pa.	H. Duffield, M.D.
Murray, Malcolm,	Philada.,	Pa.	B. Murray.
Neuhart, Laurence Augustus,	Caldwell,	Ohio.	D. Neuhart, Jr.
Norcross, Alfred Black,	Trenton,	N. J.	Geo. F. Wilson.
O'Brien, Christopher,	Conshohocken,	Pa.	H. G. J. Hallowell.
Ogden, John,	Salem,	N. J.	J. T. Shinn.
Ott, Charles William,	Philada.,	Pa.	J. O. Eberhard, M.D.
Pancoast, George Widdfield,	Moorestown,	N. J.	David L. Stackhouse.
Parish, Thomas Pleasant,	Martinsville,	Va.	T. C. Parish.
Parrish, Callistus Mitchell,	Ebensburg,	Pa.	Dr. Lemmon.
Phillips, Isaac Spencer,	Philada.,	Pa.	John E. Grove.
Preston, Edmund, Jr.,	Fallston,	Md.	W. Procter, Jr. Co.
Quick, Jacques Voorhees,	Flemington,	N. J.	A. B. Allen.
Ralston, George Forster,	Harrisburg,	Pa.	I. R. Landis, M.D.
Randolph, Charles Fitz,	Altoona,	Pa.	E. L. Boggs.
Rapp, Benedict Nicholas,	Trenton,	N. J.	Louis Oliphant.
Reed, Charles Sumner,	Atlantic City,	N. J.	E. S. Reed.
Reeser, John Wesley,	Sunbury,	Pa.	G. W. Wright.
Reichard, Charles Wolf,	Wilkesbarre,	Pa.	J. Wyeth & Bro.
Richardson, Harrie Knox,	Trenton,	N. J.	J. Wyeth & Bro.
Rickey, Charles Frank,	Mt. Sterling,	Ill.	J. C. Rickey, M. D.
Ritter, Charles Templeton,	Allentown,	Pa.	
Roedel, William Ruthrauff,	Lebanon,	Pa.	J. L. Lemberger.
Roehrig, George Frederick,	Pottsville,	Pa.	A. Cable.
Rohrman, Frank Randall,	Philada.,	Pa.	B. Shoemaker & Co.
Ruth, Wm. Augustus,	Alliance,	Ohio.	P. H. Barr & Co.
Salt, George Washington,	Dubuque,	Iowa.	T. W. Ruete.
Saunders, William Edwin,	London,	Ontario (Can.)	William Saunders.
Schierling, Gustav,	Dubuque,	Iowa.	T. W. Ruete.
Schindler, Charles,	Toledo,	Ohio.	Henry S. Barr.
Schramm, Daniel,	Philada.,	Pa.	A. B. Taylor.
Schmidt, Flor. Joseph,	Evansville,	Ind.	Flor. Chas. Schmidt.
Seeler, Andrew Julius,	Philada.,	Pa.	J. G. Wells.
Sellers, Albert Tobias,	Pottstown,	Pa.	
Scheffler, James Samuel,	Chapmansville,	Pa.	Dr. Kern.
Simpson, Robert,	Doylestown,	Pa.	O. H. Mueser.
Smith, Charles Michael,	Lebanon,	Pa.	J. A. Witmer.
Smith, Stephen Douglass,	Birdsboro,	Pa.	P. M. Ziegler, M.D.
Souder, Lewis Reed,	Atlantic City,	N. J.	Chas. Souder.
Spence, William Bayne,	Philada.,	Pa.	J. M. Wert.
Stiles, Henry Lippincott,	Moorestown,	N. J.	Dr. John R. Stevenson.
Stone, Henry Green,	Newark,	Del.	H. C. Blair's Sons.
Stoner, James Buchanan,	East Berlin,	Pa.	A. K. Stoner, M.D.
Streeter, Nehemiah Dunham,	Clinton,	N. J.	F. H. Bassett.
Stager, Edwin Wesley,	Lebanon,	Pa.	J. A. Armstrong, M.D.
Swann, Samuel Davies,	Fernandina,	Fla.	Horsey & Co.
Tatem, Henry Randolph,	Philada.,	Pa.	Lutz & Crothers.
Tatzel, Anton Swabater,	Philada.,	Pa.	A. W. Miller, M.D.
Titus, Samuel Henry,	Pennington,	N. J.	J. M. Titus.
Tod, Alva Forman,	Camden,	N. J.	L. A. Podolski.
Trusler, Charles Lawrence,	Indianapolis,	Ind.	Ward Bros.
Walker, George Allen,	Trenton,	N. J.	A. L. Hum.
Wallace, George Romeyn,	Philada.,	Pa.	Kensley & Mattison.
Walter, William Henry,	Philada.,	Pa.	J. M. Higgins.
Weber, George Washington,	Millville,	N. J.	Jos. Brakeley.
Weber, Morris Ellsworth,	West Chester,	Pa.	Jos. S. Evans.
Weber, Reinhard Julius,	Ashland,	Pa.	Aug. Weber.
Weir, John Wesley,	Wilmington,	Del.	J. M. Griffin.
Werst, Allen Leidig,	Hellertown,	Pa.	Van Buskirk & Apple.
Wilcox, William,	St. Clair,	Pa.	S. W. Brown.
Wilgus William Alcott,	Philada.,	Pa.	J. F. Wilgus.
Willard, Theo. Newton,	Shamokin,	Pa.	W. W. Robins.
Williamson, James,	Jacksonville,	Ill.	W. E. Lee.
Wittig, Charles,	Philada.,	Pa.	L. Wolff, M.D.
Zacherle, Otto Frank,	Philada.,	Pa.	Wm. B. Bicker.
Zoeller, Joseph Philip,	Pittsburg,	Pa.	Arnold Koch.